This magazine is published to promote sound thought upon and concerning industrial medicine and traumatic surgery. To that end it will contain articles, news items, reports, digests, and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited.

Industrial Medicine

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Tobacco Dust and the Human Lung

—A Controlled Study of Pulmonary Findings in an Industry Where the Silica Hazard Is Absent, as Is True of the Majority of American Industries—

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IN 1865 the term "Tabacosis" was proposed by Zenker[1] to describe the harmful effects of tobacco dust upon the lungs. In examining autopsied workers he "found brown specks in the interstitial tissue and bronchial lymph glands besides a high grade atrophic condition of the lungs which obviously (offenbar) were tinged with inhaled tobacco dust." But, we learn, there were only two autopsies, and Zenker's findings have never since been substantiated. Yet in all countries, the tobacco workers themselves have labored under the impression that tobacco dust is harmful to the lungs. In Argentina and Brazil "tabacosis" is legally compensable;[2] in the State of Pennsylvania, "any inflammation of the contact surfaces due to . . . . dusts" is compensable, even though the nature of the dust is not specified.

Was it not strange then, that in 10 years' work of studying medically a group which averaged 4000 cigar manufacturing employees this disease had not obtruded upon my medical experience? It seemed high time to apply modern roentgenological and statistical methods to this "tabacosis" in an effort to prove or disprove its existence.

I here report my fluoroscopic observations upon the lungs of 2254 individuals examined at Bayuk Cigars Inc., in Philadelphia. Of these, 1247 who have had definite exposure to tobacco dust are contrasted with a control group of 1007 applicants for employment who had never had such exposure.

The fluoroscopic technique which was followed was that of Dr. Ada Chree Reid,[3] reported in 1934, and in constant use in the Medical Rest Rooms of the Metropolitan Life Insurance Company ever since. In my hands it has proved an accurate screening process even for minimal pulmonary lesions.

MOST physicians have so narrowed their point of view in regard to dusts that "pneumoconiosis" and "silicosis" are synonymous in medical thinking. It is worth while, therefore, to point out Layet's large classification of dusts:[4]

1. Mineral dusts—
   (a) Stone dusts (silica, quartz),
   (b) Metallic dusts (iron, copper),
   (c) Saline dusts (mineral salts);
2. Vegetable dusts—
   (a) Carbon (wood, coal),
   (b) Cellular (flour, *tobacco*),
   (c) Ligneous (sawdust, straw),
   (d) Filamentous (cotton, wool);
3. Organic or animal dusts (horsehair, bristles, hair, bone);

and further, it is important to remember the multiplicity of ways these dusts may affect the lungs —for example:[2]

(a) An allergic action (asthma),
(b) Local chromatism (soot),
(c) A local micro-chemical reaction (silicosis. chalicosis),
(d) A local colloidal reaction (amylosis of the bronchi),
(e) Actual infections (anthrax, tuberculosis, pneumonia, pneumomycosis, psittacosis (?)).

Historical

SINCE Ramazzini[5] recorded that both "workers and horses" exposed to tobacco dust were afflicted with coughing and sneezing, tobacco has been blamed as predisposing the lungs of workers to every possible type of disease. Fraenkel[6] was impressed with the tobacco etiology of chronic bronchitis. Stephani[7] found tuberculosis incidence higher in Baden tobacco workers than in the gen-

eral population—and blamed this condition on tobacco. Ravacini[8] stated that the Koch bacillus itself is highly resistant to tobacco dust. Schellenberg[9] called tuberculosis the great tobacco workers' disease. Palitzsch,[10] per contra, thought exposure to tobacco dust inhibits the development of pulmonary tuberculosis. My own recently reported survey in one of the world's largest cigar factories[11] showed the incidence of pulmonary tuberculosis in these workers to be less than 50% that found in the general Philadelphia population.

The technique of studying lungs exposed to dust has become much more exact since Roentgen rays came into general use. But curiously enough, there are only two reports in the entire previous literature in which x-ray diagnosis has been applied to the lungs of tobacco workers.

In 1917, Pancoast, Miller and Landis[12] studied the general subject of dust and the lungs. In this series were included 13 tobacco workers whose lung radiographs did not differ from the x-ray appearance of normal lungs. In 1928, Krueger, Rostoski and Saupe[13] filmed 111 cigarette machine operators in Dresden. "X-ray examinations (films) revealed no signs that could surely be interpreted as tabacosis. In 18 cases there were dense hili and increased lung patterns, and in addition, scattered fleck shadows to a more or less degree in the right middle and lower lobes. These, however, were not definite enough to consider a pneumoconiotic change."

In the field of animal experimentation there is only one report, that of Joetten and Kortman[14] in 1929, concerning the dusting of animals' lungs with tobacco. It required several months of inhalation in heavy concentrations to produce "slight disease processes" in the lungs of these animals, but the elastic tissue was not harmed. Nor did the tobacco dusting predispose to tuberculosis as did dusting with clay slate dust. There was *no* blocking of the lymph flow in the lungs such as one finds in silicosis.

Human Tobacco Dust Exposure

REGARDING the workers in my present study, it is impossible to state accurately the concentrations of tobacco dust to which they have been exposed, because in Philadelphia cigar workers migrate constantly between factories, and the hygiene in these factories may vary from a very poor standard to the most modern complete control of dust, temperature and humidity. In our own factory, where air conditioning and downdraft suction are generally in use, the vast majority of our workers encounter a concentration of 55,000 particles cu. ft. made up of 60% tobacco and 40% earth dust.[15]

Technical Considerations

AS A diagnostic method, I have found the fluoroscope lends itself efficiently toward evaluating a large series of lungs. Advantage may be taken of rapid change of position in the patient, findings of interest may be watched from different angles, and the lungs may be observed throughout the phases of respiration. Granted a certain amount of familiarity with the technique, attention rapidly fixes on assaying four important attributes:

1. THE FORM OF THE THORAX: The fluoroscopist should appreciate at first glance the type of thorax which he is studying, for it must tinge his thinking concerning the thoracic contents. Architecturally there seem to be two main types into which human thoracic cages can be divided. I call them Roman and Gothic because they remind me of similar building arches. The stocky individual has a Roman thorax and the tall, thin person usually a Gothic. Because of its formation, shadows will normally be denser in the Roman than in the Gothic type of chest.

2. THE HILAR OR ROOT SHADOWS: These lie to either side of the great vessels proceeding from the heart and are *each* examined for relative density

TABLE I

UNEXPOSED FEMALES

Age	Negative	Hilus				Angiofibrosis			Totals
		+1	+2	+3	+4	Mild	Moderate	Dense	
18–30	416	28	163	31	2	103	14	19	762
30–45	31	1	15	2	0	5	8	1	53
45 and Over	1	0	1	1	0	0	2	0	3
Totals	448	29	179	34	2	108	24	20	818

UNEXPOSED MALES

18–30	87	7	23	3	0	16	1	2	130
30–45	18	2	15	2	0	4	7	1	39
45 and Over	6	1	9	2	1	1	5	1	20
Totals	111	10	47	7	1	21	13	4	189

and homogeneity, for occasionally the hilus on one side is more radio-opaque than its fellow. In order to err on the side of pathology rather than health for the purposes of this study, I have always recorded the hilus shadow which is most dense as the characteristic one for that individual chest. I do *not* include the hilar nodes in my diagnostic criteria, because in my experience, they seem to vary in density from person to person as greatly as the color of the eyes!

3. The Angiofibrotic Pattern: From the limit of the hilar shadow to the lung periphery stretches a spider-web of markings that are often spoken of as the trunk shadows and linear markings.[16] Whether they are entirely vascular or mostly fibrotic is highly controversial. I do know that advancing age will intensify them, as I will later point out in the section dealing with my results. I believe, therefore, that both fibrotic and vascular elements are present. In order to take cognizance of them both, yet avoid the controversy, I have called these shadows "the angiofibrotic pattern."

4. Nodular Densities or Calcifications: These may be seen anywhere throughout the parenchymal lung fields and must be observed from various angles to differentiate calcified nodes, calcified tubercles, ghon foci, true nodular densities or just blood vessels seen in exact cross section.

In the following tables the hilum densities are graded 1, 2, 3 and 4, and the angiofibrotic pattern

Table II

Exposed Females

Length of Exposure	Negative	Hilus +1	Hilus +2	Hilus +3	Hilus +4	Angiofibrosis Mild	Angiofibrosis Moderate	Angiofibrosis Dense	Age 18–30	Age 30–45	Age 45 & Over	Totals
1 yr.	71	11	30	6	0	21	1	0	140	4	0	144
3 yrs.	65	31	75	4	0	33	10	3	149	31	1	181
5 yrs.	50	18	72	5	0	34	7	1	122	30	2	154
7 yrs.	52	16	66	3	1	29	12	3	113	30	1	144
10 yrs.	59	24	113	8	0	48	13	3	162	56	1	219
12 yrs.	16	19	50	4	0	23	5	2	53	40	2	95
15 yrs.	14	10	25	5	0	9	1	0	29	22	3	54
20 yrs.	5	4	24	2	0	6	6	0	5	29	3	37
25 yrs.	3	0	7	1	0	3	0	1	0	12	0	12
30 yrs.	0	0	2	0	0	1	0	0	0	3	0	3
40 yrs. & Over	0	0	0	0	0	0	0	0	0	0	0	0
Totals	0	0	1	0	0	0	1	0	0	0	1	1
	335	133	465	38	1	207	56	13	605	192	7	1044

Table III

Exposed Males

Length of Exposure	Negative	Hilus +1	Hilus +2	Hilus +3	Hilus +4	Angiofibrosis Mild	Angiofibrosis Moderate	Angiofibrosis Dense	Age 18–30	Age 30–45	Age 45 & Over	Totals
1 yr.	0	1	2	0	0	0	0	0	1	2	0	3
3 yrs.	2	0	5	0	0	2	1	0	5	1	1	7
5 yrs.	0	2	5	0	0	2	2	0	7	2	1	10
7 yrs.	5	3	7	0	2	3	0	5	7	4	7	18
10 yrs.	10	5	5	0	0	3	2	0	13	7	2	22
12 yrs.	10	4	8	0	0	5	0	0	11	7	4	22
15 yrs.	3	3	13	1	0	3	2	2	1	16	3	20
20 yrs.	8	2	17	1	0	8	2	1	1	24	5	30
25 yrs.	2	2	10	0	0	3	2	2	0	12	3	15
30 yrs.	2	3	7	0	0	2	1	2	0	7	5	12
40 yrs. & Over	5	4	17	0	0	8	14	0	0	5	22	27
Totals	1	1	12	2	0	1	8	3	0	0	17	17
	48	30	108	4	2	40	34	15	46	87	70	203

densities are graded "mild," "moderate" and "dense," the only available method at present for evaluating intrathoracic shadow intensities. We have no unvarying standard for this type of roentgenography comparable to the ivory wedge density scale Stein[17] has devised for bone diagnosis. However, if the *same fluoroscopist* applies the above criteria to the lungs of those who have never been exposed to tobacco dust, as well as to the lungs of those who have been so exposed, the factors of possible error are equal. For it is from the lung characteristics of the control group that we learn whether tobacco dust alters lung appearances in the exposed group.

Results

THEREFORE, attention is first directed to Table I analyzing the findings in 818 females and 189 males who have never been exposed to inhaling tobacco dust. In the 18 to 30 age group of both sexes, the overwhelming majority of observations was recorded as negative, hilus ±1 or hilus +2, with mild density of the angiofibrotic pattern. And though the controls who had reached age 30 or over were numerically fewer, they showed definite trends away from negative lungs and toward hilus + 2. In addition, the angiofibrotic patterns shifted from mild density to a preponderance of moderate densities, bearing out the statement previously made that age normally intensifies the angiofibrotic pattern.

Table II summarizes my observations on 1044 female workers who have been exposed to tobacco dust. Here, too, negative, hilus + 1 and hilus + 2 observations preponderate hugely over all others, and mild angiofibrotic densities are the rule until most of the workers are above age 30. Then, it will be seen, moderately dense angiofibrotic patterns equal in numbers the mildly dense ones.

In other words, if we regard the heavy lines in all the tables between hilus +2 and hilus + 3, and those between mild and moderate angiofibrosis, as the critical ones, *we find that there is no tendency for the numerical balances to shift to the right of these lines under the influence of lengthening tobacco exposure. This shift only occurs as advancing age makes its weight felt as it did in the control groups.*

In the much smaller group of 203 male workers exposed to tobacco dust (Table III) we note exactly the same lung observations. The hilus densities and angiofibrotic patterns are preponderantly to the left of the critical lines and only show a tendency to shift to the right after the workers have reached 30 years of age. To put it another way, we find that no matter how many years an employee has been exposed to tobacco, there is no tendency for the lung findings to deviate from those seen in the control (unexposed) group.

Only once in this entire series of 2254 lung fluoroscopies did I encounter true nodular densities such as are often seen in full-blown silicosis, and this employee was clinically proved to have lues of the lung.

Comment

FROM roentgenological and statistical observations then, what evidence is there of the existence of pneumoconiosis (tabacosis) due to inhaling tobacco dust?

1. The x-ray appearance of *early pneumoconiosis* as defined by Pancoast and Pendergrass[18] is used as a guide,—"The hilar shadows are more prominent *than usual* and of greater density and homogeneity. The trunk shadows and linear markings show increased prominence."

I did not see any early pneumoconiosis in the sense of this definiton, for in my series the hilar shadows and angiofibrotic patterns of the employees' lungs were the exact prototype of those seen in the controls, age group for age group. This was true even for the rare instances of hilus + 3 and + 4, and dense angiofibrotic patterns (v. Tables II and III compared with Table I).

2. The *nodular form of pneumoconiosis* was not encountered.

I must conclude that in this series of 1247 cigar factory employees, the inhalation of tobacco dust does not cause the radiological appearance of the lung to deviate from normal. Nor does pneumoconiosis (tabacosis) develop no matter how long the exposure to tobacco dust.

Summary

THE pertinent literature concerning tobacco dust and human lungs is reviewed, with an account of Zenker's use of the term "Tabacosis."

2. The lungs of 2254 individuals were examined fluoroscopically. Of these, 1247 had been exposed to the inhalation of tobacco dust while working; 1007 had never been so exposed.

3. By comparing the results in these two groups and observing their similarity, it is concluded that pneumoconiosis (tabacosis) does not develop in the lungs of those who inhale tobacco dust.

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Fractures of the Forearm

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FRACTURES of both or either of the bones of the mid-forearm are, unquestionably, the most complicated and difficult of any osseous fractures. The multitude of divergent muscle pulls and the necessity of an extremely accurate result increase many-fold the hazards of this disorder. The many blood vessels and the three important nerves are ever in jeopardy when a fractured force is brought in this region.

For practical purposes only five of the forearm muscles need to be remembered, since the forearm acts chiefly as a passive support for the long flexor and extensor muscles. Only four muscles concern themselves entirely with forearm rotation. These are: the supinator brevis, the supinator longus, the pronator radii teres, and the pronator quadratus. The biceps brachii, and the triceps function to a limited degree in the forearm, the biceps being a flexor, and at times a supinator, and the triceps a pure extensor. Other muscles may become bowstrings upon the fragments, or may interpose themselves between bone ends. However, most difficulties can be laid at the door of the four rotator muscles mentioned.

For clarity it is well to consider the radius as an upward extension of the hand, for most disorders of the radius will limit rotation of the forearm. Also we must consider the ulna only as a downward extension of the upper arm, and learn that distortions can cause loss of elbow extension and/or flexion.

Specifically, then, the supinator brevis and the biceps (a supinator when the elbow is flexed) will supinate the upper fragments. In the middle third of the forearm, however, the supinator brevis balances the more distally inserted pronator radii teres, and in fractures here, the upper fragments stand neither in pronation nor supination, but in neutral. In the lower third, the supinator longus, by its insertion on the distal radial head may pull together the fractured radius and ulna. There is no more to fractured forearms than this. The bones are simply characteristically displayed by unbalanced muscle pulls.

We know that the radius and ulna are not parallel; but that the radius follows about the ulna in a gentle curve and normally rotates upon the ulna in the groove on the medial surface of the distal end of the radius. Therefore, any distortion of the radial alignment in the middle third will mechanically inhibit rotation. Marked radial shortening, without ulnar change, will distort this rotating surface and so interfere with proper pronation and supination.

In pronation, the radius and ulna are closest, while in mid-pronation supination the bones stand farthest apart. Prevention of synostosis is best accomplished by holding the fractured forearm in mid pronation-supination.

When distended by sub-fascial hemorrhage the tight bicipital fascia firmly encases the forearm muscles. A hypotenuse, then, instead of the two sides of a triangle, results. By this, accurate reposition of bone ends becomes more difficult, and early reduction of forearm fractures becomes increasingly imperative.

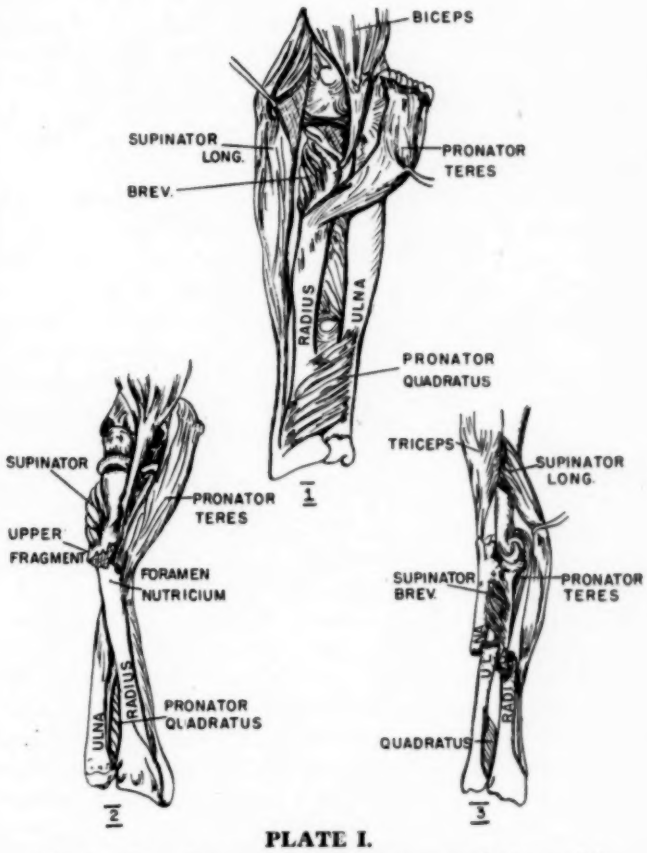


PLATE I.

Fig. 1. Showing supinator longus — pronator radii teres — and pronator quadratus

Fig. 2. Fracture between supinator brevis and pronator radii teres. In this the upper radial fragment is supinated

Fig. 3. Fracture below supinator brevis and pronator radii teres. In this the antagonistic muscles balance each other and the upper fragments stand in neutral

Functionally, the ulna is most important in its upper third. When distortions occur here, loss of flexion and extension result. In the lower third, accurate reduction of the radius is more important, since here rotation and hand support are more likely to be interefered with. Such is the anatomic basis for fractures of the forearm. If the operator can keep in mind this relatively simple description, his forearm fracture treatment will be greatly simplified.

METHODS OF REDUCTION: Anatomical restoration and bone union is the prime desideratum in all forearm fractures. Here we will not deal with

*Read before the Fulton County Medical Society, Johnstown, N. Y., January 19, 1939.

the green-stick fractures, for they can usually be molded and held in place while awaiting union. We will deal only with fractures of one or both bones of the forearm in the middle third.

In a forearm fracture it is necessary to know:

(a) Location of fracture.

(b) The number of bones broken.

(c) Whether the fracture is above, at, or below the insertion of the pronator radii teres.

(d) Whether the fracture lines are sufficiently transverse as to hold a position without internal fixation.

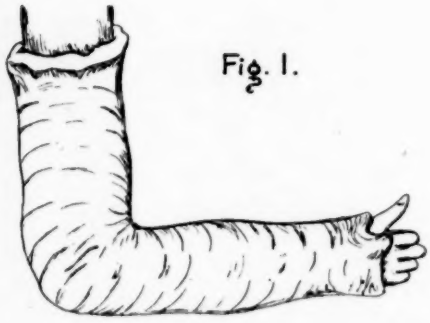
(e) Whether there is interposed muscle.

(f) Whether the fascia has contracted or distended.

If those results cannot be accomplished, then open reduction must be considered. This is best done by bone plates or medullary pegs. However, no open bone reduction should be done if one-third or one-half end-to-end apposition of the bone ends can be obtained without its use.

Finally, when satisfactory reduction has been accomplished by traction, or by manipulation, or both, then external fixation must be applied and retained — in the adult for no less then 60 days, and usually not more than 90 days.

The position varies with the fracture level, as explained in the section on anatomy. In fractures of the upper third, antagonistic muscle pulls are best released by full supination of the forearm,



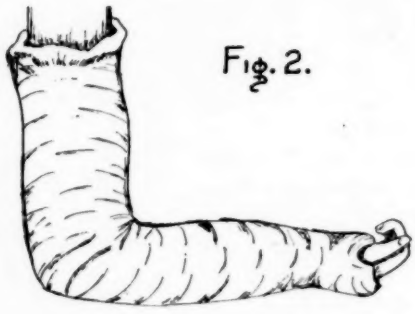


PLATE II.

Fig. 1. Forearm in mid pronation-supination. This position is used in all fractures except those above the insertion of the pronator radii teres

Fig. 2. Forearm in supination. This position is used only above the pronator radii teres insertion

PLATE III.

Deformity due to shortening of radius. This will always limit rotation

First and always, muscle pulls must be released. Perhaps this can be done slowly by the use of traction, or more rapidly by the use of anesthesia. If a fracture of one bone, simple manipulation, coupled with traction of the wrist (the elbow being held in flexion and in counter-traction by an assistant) may be sufficient to lock the bone ends. If the fragments be so oblique as to preclude locking of bone ends, it may be necessary to resort to running traction. This traction is best applied by

PLATE IV.

Characteristic deformity in Volkmann's ischemic paralysis. This view should show a flexed elbow

a sling about the hand, or by use of a Kirschner wire through the wrist. Later, the Kirschner wire may be incorporated in the finished plaster. Should one fracture be oblique and the second transverse, simple manipulation, or manipulation and traction, may allow reposition of the transverse fracture, and replacement and retention of the oblique one. It is well to reiterate here that radial reposition must be absolute in the lower third and perfectly correct in the ulna's upper third. Therefore, given a choice of position of either bone, the lower radius reduction must be correct, to the comparative neglect of the upper radial position.

and right-angled elbow flexion. In mid-third fractures, where the pronator radii teres and the short supinator balance, the mid-pronation position after reduction is recommended. In no event should full pronation be used.

Postoperative fixation in expert hands is well done by wooden splints extending from the metacarpal phalangeal joint to well above the elbow. For the occasional operation, however, plaster slabs on the volar and dorsal surfaces of the forearm, bound with bandage, will be more feasible. Circular plaster should never be used, since by this pushing together the radius and ulna, one purpose of the reduction is defeated. Ordinarily, when the radius and ulna are too closely approximated, digital pressure, made permanent by small wooden dowels, longitudinally overlying the middle of these plaster slabs, will tend to distract the bones.

The complications of mid-forearm fractures are:

(a) *Dislocation of the radial head or fracture of the neck of the radius:* This location can be replaced by acute flexion of the elbow, providing this does not displace the fragments of the accompanying ulnar fracture. If this occurs, then the orbicular ligament must be repaired and an open ulnar reduction done. If the radial neck is fractured, the best treatment is removal of the radial head, except in individuals under puberty. A few operators have recommended the replacement and nailing of the radial head. We recommend removal.

(b) *Shortening of the radius:* All reductions must have restoration of radial length as a prime ambition. If the radial styloid is less than three-

quarters of an inch more distal than is the ulnar styloid, loss of rotation will certainly occur.

(c) *Volkmann's contracture:* Massive hemorrhages from any of the four nutrient radial and ulnar vessels encourage sub-fascial distention and passive congestion by pressure upon the cubital veins. Occasionally a secondary fibrosis of the muscles or organization of blood clots about the nerves, particularly the median, cause a nearly similar condition. By careful observation of the individual, adequate signs of this disorder will be easily seen. Early excruciating pain in the upper forearm indicates examination or even abandonment of the reduction, lest circulation be irreparably damaged. Often the bicipital fascia can be cut to relieve its distention. It is never proper to profoundly narcotize the patient with a fractured forearm. Pain is the best indicator of these dread complications.

(d) *Synostosis:* Massive hemorrhage between the bones encourages union between the radius and ulna, which, of course, permanently inhibits forearm rotation. This is best avoided by gentle and infrequent manipulations of the forearm during reduction. The use of the supine forearm position, by distracting the bones, may eliminate this.

(e) *Open reduction:* No open reduction should be done if one-third to one-half apposition can be obtained. Fully 70% of mid-forearm fractures can be reduced by the closed method. Fifteen per cent must be surgically reduced, and in the other 15%, the closed method, skillfully applied, will produce a satisfactory result.

(f) *Non-union:* Non-union, while not especially common in mid-forearm fractures, will and does occur if motion of the fragments is permitted before the sixtieth day. Always it is better to retain the original fixation rather than to try a second set of splints during the course of the treatment.

CONCLUSION: Fractures of the mid-forearm, from the anatomical point of view, are less troublesome than is often believed. Fractures must be carefully and anatomically considered, and every treatment directed toward restoration of the forearm's most important duties.

The Public Health Aspects of Occupational Hygiene

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Detroit, Michigan

AS WE retrace the path down which the public health administrative services have traveled during the past century, we observe at least four distinct stages in its evolution.* In the pre-bacteriologic days, prior to the great discoveries of Pasteur and Koch and their colleagues, the sanitarian placed great emphasis upon environment as a factor in determining the health status of mankind. Erroneous conceptions of the cause and mode of spread of communicable diseases resulted in special attention upon the inanimate. These were the pre-industrialized days when the pollution of air with toxic substances was relatively unimportant; and the heathenish persistence of man to pollute his own water supply resulted in wide-spread epidemics of cholera, typhoid, dysentery, and other diseases of the alimentary tract. Since then, the elimination of insanitary excreta disposal, the safeguards provided through modern sewage disposal and treatment, refuse and waste disposal, and the purification of our water supplies, have virtually obliterated typhoid as a cause of death in our mortality tables. The sanitary engineer and the physician who possessed a sanitary viewpoint constituted the early pioneers in public health both in this country and abroad.

With the advent of the new science of bacteriology and the proved relationship between the inciting organic substance and the disease which it produces, there developed in the mind of the sanitarian a distinct leaning away from the all-important roll which the environment had previously held. This attitude developed quite naturally. As the illnesses then receiving major consideration were those now found to be due to micro-organisms and spread through the careless personal habits of man, or through his association with animals, success was met on every hand. As the new health men applied the knowledge which followed in the wake of the new science of bacteriology, the individual held the spotlight; not his environment. There gradually developed as a corollary, emphasis upon the rules and techniques of health education whereby the studies of the laboratory or health institute are translated into simple terms and words readily understood by the layman. The extent to which the latter gave serious heed to these simple principles of hygiene determined the health status of man and his family, and by summation the health of the community.

For the most part we had lost sight of the fact that with the advance of civilization man creates new hazards for himself. Our forefathers who lived the simple nomadic life of prehistoric days were probably not struck down by the tubercle bacillus until some ingenious individual, under pressure of hunger or warfare, built the first human dwelling. From that day forth man has struggled with the waxy bacillus for the possession of his home. The primitive man of the plains or mountains, the aborigines of our own vast country apparently knew little or nothing of tuberculosis until the civilized white man brought it among them. With the development of industry, the refinement of our natural resources, the preparation of toxic substances, poisonous gases, vapors, dust, high temperature, and humidity, civilized man again comes face to face with the problem of health. Must the privilege of the commercial and recreational advantages of the motor car be predicated upon a widespread prevalence of lead intoxication? Must the convenience of reading the watch dial during the hours of night

* Read at the Annual Meeting of the American Association of Industrial Physicians and Surgeons with the American Conference on Occupational Diseases and Industrial Hygiene, Cleveland, Ohio, June 5, 1939.

be grounded upon an increase in radium poisoning? Must the high speed of industry, with ever-increasing rates of production at lower unit cost, be purchased at the expense of the physical and mental stamina of our young men and women? The answer is of course in the negative. The establishment of procedures with which to combat these new menaces to our health is now a major responsibility of our local public health department.

INDUSTRIAL hygiene has long flirted with the local health officer on the periphery of his public health program. With few noteworthy exceptions, prior to 1936 there had been much talk about industrial hygiene but little action. A few cities boldly proclaimed to the world that they had a division of industrial hygiene but close examination too frequently showed that this was merely a different name for a housing or factory inspector, a food analyst, or even the health officer's chauffeur. The American Public Health Association in its original draft of the Appraisal Form for City Health Work and in the five revisions has repeatedly included, for study purposes, reference to industrial hygiene. It remained, however, for the passage of the Social Security Act in 1936 to provide the wherewithal and the impetus with which to give this service its much needed official start. Even now, relatively little has been done locally. At the beginning of the current calendar year $385,000 was being spent in the name of industrial hygiene in 27 states. Eighty-five per cent of this money came from Federal funds. The remainder came from state funds with the exception of two cities which have made industrial hygiene a part of their local program and budget. At the Surgeon-General's Conference held in Washington this past April, it was reported that in 29 states there is now a division of industrial hygiene either in the state health department or the state department of labor (in New York and Massachusetts the industrial hygiene division is in the state department of labor). We are informed that Minnesota has passed a permissive law and will be the thirtieth state to establish a division of industrial hygiene. The advance through the state health departments has been rapid with the availability of Federal funds. The states have been slow in accepting their share of the responsibility and the large cities have been even slower. We see no very good reason to argue the merit of a state-wide or distinctly local industrial hygiene service. Surely, for the smaller communities and rural areas a state bureau offers the only economic solution. The work of the state health department can be effectively carried into the large cities. The one essential is that the work be done, that suitable procedures should be instituted to develop the medical and engineering facilities to safeguard the health of our workers.

AS WE glance back over the road traveled by our health pioneers we observe that each few years some special problem seems to hold the center of the arena. It may be tuberculosis, cancer, heart disease, mental hygiene, syphilis, or birth control.

The habit of designating a day, a week, a month, or even a year, as "poppy day for War Veterans," "home-coming week for the natives," "a month for the crippled child," or "a year for the case of tuberculosis," is the favorite American pastime. Possibly such technique is essential for the high-pressured money-raiser who must capture public interest while on the run or who must compete with the sentimentalist who runs a hospital for sick cats.

Such technique does not appeal to the public health administrator whose program must go on day after day, month after month, and year after year—so designed as to give the full benefits to all people of his community without limitation. Industrial hygiene should not come into public health practice as a new adventure seeking trial, but should be woven into the very fabric of the permanent health safeguards of the community. There should be no barrier to wall off industrial hygiene from the tuberculosis, syphilis, sanitation, nursing, medical, or other programs of the local health department. We should avoid the mistake made when we established specialized public health nursing service, that is, a separate group of nurses for schools, infant welfare, communicable diseases, tuberculosis, syphilis, and bedside nursing.

We know full well that the generalized public health nursing program is both more economical and more efficient and at the same time, by the diversification of activities, provides a stimulation to the nurse herself. The nurses are now distributed by area and each is well trained in the science of health education and in the art of nursing service so as to readily handle all the perplexing problems whch confront the family unit—be they of a physical or mental character. Of course there is supervision for the nursing personnel of a specialized type so that neither tuberculosis, child welfare, nor any other activities becomes lost in the shuffle. And so it should be with industrial hygiene. Every health worker must, to some extent at least, be an industrial hygienist. There will of course be the specialist who is trained as physician, engineer or chemist in his chosen occupation. My expressed hope, however, is that industrial hygiene will become an every-day activity of the local health department and that so far as possible every physician, nurse, dentist, clerk, engineer, or other individual working with the health department shall fit into his small niche as a part of this important program.

You will recall the experience of many of the local associations established to prevent the spread of tuberculosis. It was not long before these organizations were forced to broaden their activities, as the tuberculosis problem spills over into many other health adventures such as good housing, milk pasteurization, laboratory service, health education and pre-school and school health exam-

inations. Most of our cities and many of our small communities are highly industrialized. The dangers of occupation are by no means limited to those who dwell in our congested metropolitan areas. Broad interpretation includes the majority of us among the industrial workers. The recent bulletin of the Ohio Department of Health states that almost one million Buckeyes are employed in the heavy industries. By including four or five dependents for each wage earner, it is claimed that two-thirds of the total population of Ohio are influenced by anything which adversely affects the health of the worker. Build your industrial hygiene service into the very fabric of your health department, but set aside in a relatively small group those experts in medicine and engineering who will give spark and life to your activity.

THE modern concept of local health service is the establishment in each area (city, county, or district) of a whole-time health department headed by a physician who has had at least one year of specialized training in public health work at University level and who has had one or more years of practical field work. The health officer should be assisted by public health nurses trained in health education, a sanitary engineer or a sanitation officer and a clerk-statistician. The nucleus then of the local health department should be at least four individuals, and there should be additional public health nurses so as to provide a minimum of one for each 5000 of population.[1]

The area to be included in the local health department will depend upon the per capita wealth and the amount of state, Federal, or non-official aid available.

The cities or counties which are too small to maintain such a basic health unit should be combined into larger areas or districts. The small health department will probably never have on its staff a physician, engineer, or chemist who has specialized in industrial hygiene unless the locality be such that industry may provide such service from non-official funds. Usually such a locality will receive its industrial health service from the state department of health. This small unit should, however, be made industrial-hygiene conscious. The problems of occupation, like those of over-crowding, poor lighting, and insanitary dwellings, may be found in the most sparsely settled regions.

How can we proceed to extend the advantages of industrial hygiene through the medium of our health department personnel? The procedure should be the same as that employed for any other health adventure. The health officer must establish facilities for continued education of his personnel. Here the specialists in your field become the teachers to guide the initiates and prepare them for the discharge of their new obligations. In the larger health departments, staff meetings are held with regularity—not less frequently than once a week. Such meetings afford an ideal opportunity for the bureau and division heads to discuss the relationship of routine sanitary inspection to the engineering problems of industry, the case of syphilis and its employment, the tuberculosis case that follows exposure to silica dust, the pickling vat in the nickel-plating works in relation to syphonage and water-line pollution, the relationship of a newly discovered case of smallpox in an industrial plant to the established program of pre-school and school child inoculation. The staff meeting is a forum for the faculty of health workers through which the specialized programs become veneered with a generalized aspect.

As health administrators, we must provide for the continued education of our sanitary officers, our public health nurses, and our general inspectorial and clerical personnel. For some, the informality of a refresher course will suffice; for others like the public health nurse, there should be established, at University level, academic and field training headed toward a Certificate in Public Health Nursing, or better yet, a Bachelor or Master degree. The curriculum should include a special course in industrial hygiene, emphasizing not only the place of the public health nurse in such program but also portraying a picture of the relationship of the technical industrial hygiene problems to the general administrative set-up of the modern health department.

ONE of our greatest needs of the moment is the integration into our health plan of all those professional groups which by training and temperament are suited and prepared to become a part of our health education programs. Especially important are the physicians in private practice who possess an enormous latent reservoir which can be activated in the name of health education and industrial hygiene. The physician in general practice as well as the specialist in industrial hygiene should be shown the part which he may play in giving a fullness and wholesomeness to the daily life of the industrial workers as well as discovering those departures from normal health which, if permitted to endure, will detract from the effectiveness of work and create an economic hazard for the family.

An excellent example of the integration and correlation of all groups into a unified health education program is to be found in seven rural counties of southwestern Michigan, where the W. K. Kellogg Foundation has assisted the local communities in establishing their health departments. Each county has its own whole-time health department which receives financial support from the local people, from the State Department of Health, and from the Foundation. About $1.00 per capita is being spent annually in maintaining the conventional health service. To such facility, however, has been added the participation in preventive medicine of all practicing physicians and

1. Winslow has recommended one nurse for every 2000 of population; some cities like Boston, Detroit, and Syracuse have one to every 3000.

dentists, the school teachers, the superintendents, the board members, the newspaper editors, the ministers, the veterinarians, and all others who, because of their profession or position may contribute to the health, welfare, and happiness of the child and his family. Here, truly, has been developed a pooling of a health interest which permeates the life of every individual living within the limits of these seven counties. Here, under the impetus of a well organized bureau of industrial hygiene in the State Health Department, the problems of occupational hygiene become a matter of daily concern to the entire personnel of the health department and through such impetus establish an influence upon the minds and actions of the employers and employees of this area. Technical instruction and supervision are provided by the expert industrial hygienist from the State Health Department, but the routine service becomes a matter of concern to the local health officer, his public health nurses, and the sanitary engineers.

The family physician has his part to play, both as health educator and as an influence in preventing the development of health hazards and in the prompt discovery and isolation of conditions which may prove inimical to health. He searches for the early case of tuberculosis in the employed individual. The preventive and diagnostic services become a part of his daily occupation. He practices preventive as well as curative medicine in his own office. His establishment literally becomes a house of health from which flows an ever-increasing amount of preventive medicine in the form of health examinations, tuberculin tests, x-rays, blood tests, diphtheria and smallpox inoculations, and the removal of physical mishaps due to poor vision, hearing, bad tonsils, and the like, which impede the individual in his normal growth and development.

Here, indeed, health becomes a living entity—something to be felt and experienced, something as tangible to the layman as food, fuel, shelter, clothing, or any other essential of life. A program of this character does not come by chance; it is a result of careful, long-time planning on the part of the people themselves and through their chosen leaders who serve as their health men.

WHO would venture to define with exactness where preventive medicine stops and curative medicine begins? Where does the health department end and the family physician begin? What marks the need of the tuberculosis program and the beginning of the industrial hygiene service?

We are not greatly interested in the meticulous description of such limitations. We are interested in the broader concept of providing adequate service through correlation and cooperation, and now, with industrial hygiene a recognized and established entity in modern health practice, let us fit this service into the needs of the more generalized program, using whatever professional tools will best serve our needs and extend our services.

In Detroit we have been concerned with the program of tuberculosis control realizing full well the relationship of this problem of our industrial life and knowing full well that all our people are more or less involved in the industrialization of our community. We, therefore, tie together our industrial hygiene and our tuberculosis control programs. Administratively, of course, they are separate entities, each with its own director and staff of specialists, but functioning through an administrative and educational program which has a common interest. In the past two years particular need has been directed at the discovery of the early case of pulmonary tuberculosis, realizing that to permit cases to advance into the more destructive stages is undesirable and distinctly uneconomical. Every new case discovered in its advanced stage costs the community for hospital care at least twice the expense incurred in caring for the minimal case. If we include the damage done by the positive sputum case among contacts and friends, we have a financial burden which no community can bear. Into our program of health education has been written the participation of the physician in private practice and the needs of the industrial worker. The specific hazards known to exist in our manufacturing plants have been removed and at the same time we are isolating in suitably maintained hospitals and sanatoria the individual hazards when they appear as recently diagnosed cases of pulmonary tuberculosis. In two years 130,000 persons have visited their family physician, been tuberculin tested, and when indicated x-rayed, and from this group have been isolated more than 750 newly discovered cases of tuberculosis—nearly a third of which were found in their minimal stage. Does this not well illustrate how the cooperation of many individuals and groups can effectively handle a problem which is paramount to the interests of the industrial worker?

I leave to others the technical discussions and complicated verbiage of the industrial hygiene specialist. I bring to you the plea of one who has served in the ranks of the public health administrators for more than a quarter of a century, with the hope that the challenging problems of the industrial hygienist will be met on the same fair, wide basis with which we have accepted the challenge against syphilis, tuberculosis, the other communicable diseases, and with which we have worked effectively in the reduction of maternal, infant, and child morbidity and mortality. The United States Public Health Service is graciously extending a helping hand to state and local health officers. It is our obligation to accept this golden opportunity to consolidate and strengthen our combat with those influences which uncontrolled will bear heavily upon the usefulness of our industrial workers and deprive them of that fullness and wholesomeness of life which should be their heritage.

American Railway Surgeons

—Fiftieth Annual Meeting—

THE American Association of Railway Surgeons extends to all members of the medical profession a cordial invitation to participate in its Fiftieth Annual Meeting, at the Palmer House, in Chicago, on Monday, Tuesday, and Wednesday, September 11-13, 1939.

This meeting has been planned as a fitting expression of the significant progress that has been made in railway surgery during the half-century throughout which the members of this organization have cooperated in achievement. The Surgical Associations of nineteen railroads entering Chicago will convene with the American Association in joint session. And the Program Committee, under the leadership of Dr. Metz, has prepared a Program of exceptional excellence and value. The thirty-one speakers are outstanding in their professional attainments, and their subjects are, in each instance, those upon which they speak from the authoritative background of personal interest and enlightening experience. The presentations, limited as to time, will be correspondingly more forceful in content.

Tuesday evening, September 12, will be the occasion of the Annual Banquet, at which Mr. J. M. Symes, General Manager of the Pennsylvania Railroad, and, until recently, Vice-President of the Association of American Railroads, will be the principal speaker. His subject will be "Railroad Problems of Today."

The program is as follows:

Monday, September 11:

OS CALCIS Fractures, an Improved Treatment," by Otto W. Yoerg, M.D.

"Open Reduction on Severe Fractures," by John R. Nilsson, M.D.

"Contributing and Complicating Factors Entering into Railroad and Other Industrial Accidents," by D. W. Ward, M.D.

"The Use of Fixed Traction in Plaster of Paris for Fractures in the Lower Third of the Leg and Ankle Joint," by Hiram W. Orr, M.D.

"Fracture of Tibia Involving Knee Joint," by R. C. Webb, M.D.

"The Place of the Electrocardiograph in the Physical Examination," by J. Roscoe Miller, M.D.

"Eye Injuries and Their Management," by Sanford Gifford, M.D.

"Clinical Significance of Renal and Urethral Anomalies," by Vincent J. O'Conor, M.D.

"Pertrochanteric Fractures," by J. J. Callahan, M.D.

"Certain Aspects of Skull Fracture Management," by Harry E. Mock, M.D.

"Clinical Suggestions on Intestinal Obstruction," by A. H. Montgomery, M.D.

Tuesday, September 12:

TRIGEMINAL Neuralgia, Accurate Differential Section with the Preservation of the Ophthalmic Branch," by Roland M. Klemme, M.D.

"Obligation of Railway Surgeon," C. A. Walker, M.D.

"The Role of the Railroad Hospital Laboratory in the Control of Syphilis," by Edward M. Butt, M.D.

"Conservative Treatment of Fractures," by Edwin W. Ryerson, M.D.

"Routine Neurological Examination," by George W. Hall, M.D.

"Traumatic Injuries Causing Difficulties in Diagnosis," by J. J. Kearns, M.D.

"The Management of Compound Injuries of the Face and Jaws," by James B. Brown, M.D.

"Subtemporal Decompression; Indications and Surgical Technique," by Eric Oldberg, M.D.

"Treatment of the Elbow," Samuel S. Mathews, M.D.

"Fractures of Transverse Processes of Lumbar Vertebrae," by R. M. Dodson, M.D.

"Hoarseness: Color Motion Picture Illustrating Surgical Pathology of the Larynx," by Paul H. Holinger, M.D.

Wednesday, September 13:

SUBTROCHANTERIC Osteotomy for Fresh and Old Fractures of the Neck of the Femur," by Frank G. Murphy, M.D.

"The Principals Involved in the Operation for Internal Fixation of Fractures of the Neck of the Femur," by Ralph G. Carothers, M.D.

"Pathological Fractures in Relation to Industry," by John H. Alexander, M.D.

"Injuries to the Semi-lunar Cartilage," by Harry V. Spaulding, M.D.

"The Danger of the Indiscriminate Use of the Barbiturates," by Harry H. Drysdale, M.D.

"Fractures of the Spine," by Harold H. Baker, M.D.

"Prediction of Coronary Accidents," by Gordon B. Myers, M.D.

"Calibrated Skin Grafts of Intermediate Thickness," by Earl C. Padgett, M.D.

"Differential Diagnosis and Treatment of Frost Bite and Its Relation to Buerger's Disease," Frank V. Theis, M.D.

Solvents

A DESCRIPTION of injuries to certain organic systems or to separate organs, listing all of the solvents which may cause such injuries, would be of no clinical value because of the impossibility of deriving a plastic picture of the typical intoxication production by a certain solvent.* The description of solvents on basis of their chemical grouping and their action on the human body would not only require more than the time allotted, it would also afford too much room for injuries of secondary importance, making it difficult to stress sufficiently those injuries due to solvents which are of cardinal importance . . . Trade names of many poisonous solvents make prophylaxis difficult. Mixtures of solvents, with various admixtures, complicate the clinical picture and make prognosis uncertain. Habit-forming properties, which have been observed in some solvents of narcotic nature, represent an additional problem. The hope is expressed that persistent publication of casuistic observations of single cases as well as mass intoxications will clarify the clinical picture of intoxications due to pure solvents and mixtures. Promising beginnings have already been made in some of the most important intoxications due to solvents. It is a duty of the clinician to contribute to the prevention of injuries due to such intoxications by promoting knowledge regarding solvents and pointing out the dangers connected with their use. In this work he must cooperate with technicians and engineers even more than heretofore.

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* From a study of "Clinical Aspects of Injuries Due to Solvents Other Than the Aromatic Group," presented before the Section on Occupational Diseasse of the VIII (1938) International Congress for Industrial Accidents and Occupational Diseases, by Prof. Dr. E. W. Baader.

Silicosis: A Differential Study

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SILICOSIS is the oldest and most important of all industrial diseases.* More than 200 industries are responsible for dust hazards, and at least half a million Americans are exposed to siliceous dusts in their occupations. The majority of these are workers in mines, foundries, and quarries. Countless others are engaged in sandblasting, enameling, construction work, and the allied trades. The economic loss incident to disability, medical care, and compensation totals a staggering sum. Laws governing working conditions and regulating disability compensation are being passed for the protection of workmen and employers. Many States, however, have made no provision for control of these problems, and there is a resultant lack of uniformity in corrective measures and compensation awards.

Etiology

SILICOSIS is caused by the prolonged inhalation of free silica dust (SiO_2). The time required for development of symptoms varies within wide limits. Occasional cases are seen after an exposure of two years or less, while others require 20 to 30 years. The time element is modified by such factors as (1) complicating infection, (2) the amount of free silica inhaled, (3) the size of the particles, and (4) individual susceptibility. All other factors being equal, the time required for development of symptoms is inversely proportional to the size of the particles inhaled.

Pathology

ONCE the dust has entered the respiratory tract the larger particles are swept out by the ciliated epithelium, while particles less than 6 microns enter the lung alveoli. These offending particles are then engulfed by wandering monocytes for transportation to the lymphatics. The lung is drained by a channel network in close relation to the blood vessels and bronchi. Outside the lymph vessels themselves, but at points of intersection and termination, are found minute deposits of lymphoid tissue. It is toward these deposits that the dust-laden monocytes travel to discharge their burdens into the lymph stream. When traffic becomes congested, however, there is a piling up of the phagocytes in the lymphoid deposits and mechanical pressure is exerted on the lymph channels. Thus, the drainage system suffers a functional impairment with definite structural changes. The vascular trunks become inflamed, thick, and rough. Connective tissue is laid down in the lymphoid deposits and in the tracheo-bronchial nodes, thus producing the characteristic nodules and the thickened hili. In the course of time the nodules coalesce and areas of massive fibrosis invade the parenchyma. These processes are hastened by a supervening infection.

Diagnosis

THE diagnosis of silicosis is dependent upon information supplied by: (1) history; (2) physical signs and symptoms; (3) x-rays; and (4) laboratory tests.

The history must be complete and should cover in chronological sequence the various occupational periods of the workman. Special attention should be given to the time spent in each occupation and to attendant dust hazards. A diagnosis of silicosis is never justified without a history of adequate exposure.

In the first stage of the disease there are no signs or symptoms worthy of mention. This is the stage of perivascular lymphatic infiltration. There may be a slight unproductive cough and a slight shortness of breath. Since there is no disability, any functional or anatomical changes might easily escape detection. In the second stage the findings are more definite. This is the stage of nodulation. The cough is more troublesome and the shortness of breath is more pronounced. The capacity for work is reduced and colds are more common. Examination of the chest will reveal diminished expansion and an increase in the size of the thoracic cage. The inspiratory murmur is shortened and higher pitched, while the expiratory murmur is prolonged. Decreased resonance is found over the upper portion of the chest with increased resonance at the bases. Rales may or may not be heard. In the third stage, that of diffuse fibrosis, the patient is totally disabled. Dyspnea is the cardinal symptom, and the cough is productive. Loss of weight, fever, rapid pulse, hemoptysis, diminished expansion, and night sweats, are frequently encountered. Cyanosis, clubbing of the fingers, and curved nails attest the circulatory-respiratory embarrassment. The percussion note is dull to flat, and the respiratory sounds are similar to those of the second stage.

The essential change noted in first stage roentgenographs is the increase of linear markings representing the vascular tree. There may be a slight beading also. The hilum shadows are increased in size and are less sharply defined than in the normal. Emphysema may be noted at the bases. These findings are symmetrical.

In the second stage the characteristic nodules are seen symmetrically distributed throughout the lung fields, but are more marked in the mid-zones. The nodules vary in size from a pin-head to 6 mm. in diameter, and are very definite in outline. The hilum shadows are similar to those of the first stage. Diaphragmatic adhesions may or may not be seen, and the mediastinum may show retraction. Emphysema appears at the bases.

Conglomeration of the nodules and fibrosis characterize the third stage of the disease. Emphysema is pronounced at the bases. The mid-sections

* From the Woodmen of the World War Memorial Hospital, San Antonio, Texas.

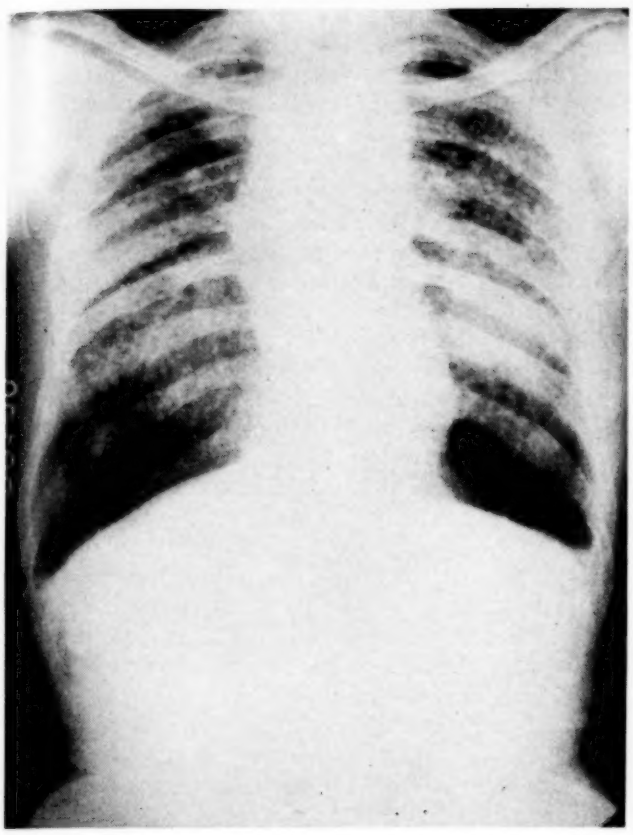

Fig. 1.

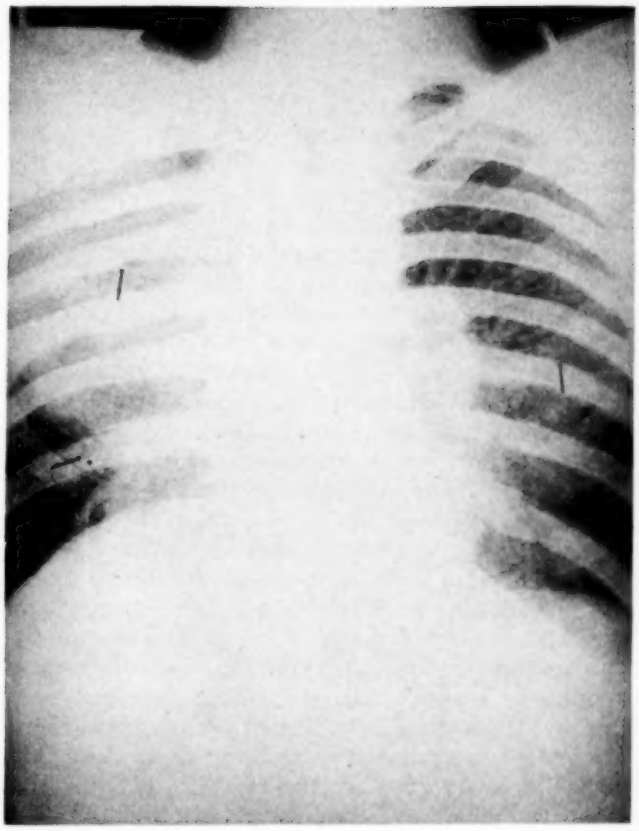

Fig. 2.

are dense. As in the other two stages these changes are symmetrical and bilateral.

In any case of doubtful etiology the laboratory may be responsible for the final diagnosis. In cases uncomplicated the finding of large quantities of silica in sputum and urine will confirm a diagnosis of simple silicosis. The presence of tuberculosis as a complication can frequently be determined by sputum examination and guinea pig inoculation. However, failure to find Koch's bacillus does not preclude the presence of tuberculosis, and a diagnosis of simple silicosis should be made with reservation in any advanced case. It is to be remembered, also, that pathogenic fungi often invade the lungs and cause pathology. A thorough search should be made for such organisms in every sputum examination.

Differential Diagnosis and Complications

THERE are several conditions other than silicosis that give rise to nodule formation and cause confusion in diagnosis. Chief of these is miliary tuberculosis. A close study of the two diseases, however, will reveal clinical and radiological differences. Miliary tuberculosis usually appears in the early decades of life, while silicosis is seldom seen before the age of 40. Sputum examination, sedimentation rate, and blood picture are factors of differential importance. The radiograph of the miliary lung will reveal nodules rarely homogenous in appearance. The shadows vary in size and their borders are ill-defined and fuzzy, especially if the condition is widespread.

Mycotic infections are responsible for nodule formation in certain cases, and these require detailed study. These conditions may complicate tuberculosis or they may exist alone. The nodules are generally more brilliant, discrete, and clear-cut than those of silicosis. Laboratory procedures may decide the diagnosis.

Since tuberculosis complicates a large percentage of the advanced cases of silicosis, each case demands individual study. The symptom-complex is fairly constant. Dyspnea is the universal complaint, and the disability is severe. Low grade toxicity appears early but progresses with time. Roentgen findings vary with the coexisting factors. The shadows are less discrete and less distinct. Large fibrous masses are commonly seen throughout the upper and middle lobes. Retraction of the mediastinum, and diaphragmatic adhesions are common. Cavitation may be expected and emphysema is invariably found at the bases.

Fig. 1 is a chest roentgenogram of a man 58 years old who had mined gold 22 years. He was sent to the Woodmen of the World Hospital with a diagnosis of silico-tuberculosis. He complained chiefly of dyspnea, pleurisy, loss of strength, and productive cough. The physical signs were very indefinite. There was no fever, and the sputum was repeatedly negative for tubercle bacilli. Diagnosis: Simple silicosis. Many such cases are sent to the Woodmen of the World Hospital with a diagnosis of pulmonary tuberculosis.

Fig. 2 is a chest roentgenogram of a man 43 years old who mined copper 25 years. He was sent to the Woodmen of the World Hospital with a diagnosis of simple silicosis. On admission he complained chiefly of dyspnea, weakness, loss of weight, productive cough, and slight sub-sternal

pain. There was no fever. Physical examination revealed impaired resonance with harsh breath sounds over all of the right lung. Rales were heard from apex to base. Over the left lung the breath sounds were harsh but no rales were heard. The sputum was highly positive for tubercle bacilli. Diagnosis: Silico-tuberculosis.

Fig. 3 is a chest roentgenogram of a man 47 years old who had mined gold for 23 years. He was sent to the Woodmen of the World Hospital with a diagnosis of silico-tuberculosis. One entrance he complained chiefly of dyspnea, loss of weight and strength, right pleurisy, night sweats, and fever. Resonance was impaired and rales were heard over both lung fields. The sputum was highly positive for tubercle bacilli. Diagnosis: Silico-tuberculosis complicated by pleurisy with effusion.

Fig. 4 is a chest roentgenogram of a man 22 years old who had been a farm laborer since childhood. When brought to the Woodmen of the World Hospital for examination he was complaining of dyspnea, loss of weight and strength, and productive cough. He was not certain as to whether there had been fever. He had suffered two small hemorrhages during the 12 months preceding admission to the Hospital. Physical examination revealed impaired resonance and medium rales over both lung fields. The sputum was highly positive for tubercle bacilli. Note the similarity with Fig. 7, in which a mistaken diagnosis of miliary tuberculosis was made on x-ray. Fig. 4 was diagnosed miliary tuberculosis (chronic).

Figures 5, 6, 7, and 8 are chest roentgenograms of a mining engineer, age 34, who had worked 10 years underground. When first examined in January, 1934, he complained chiefly of productive cough and weakness. The temperature ranged from 100° to 100.5° F. The pulse was rapid. Sputum was negative for tubercle bacilli but was positive for Monilia. Cultures were highly positive for Monilia. The roentgenogram, Fig. 5, showed a first-stage silicosis, and semi-soft nodes (Monilia) between the middle and outer thirds of the lung fields. Potassium iodide and an autogenous vaccine were given and the symptoms disappeared within three months. The second roentgenogram, Fig. 6, was made in September, 1934, and shows calcified nodes between the middle and outer thirds of the lung fields. The patient at this time was in good health.

The third roentgenogram, Fig. 7, was made in June, 1936. At that time the patient had a severe nasal and lower respiratory infection. He was quite sick, with temperature 102.5° F., and a pulse rate of 120. He was in bed a month, during which time he had a severe cough and profuse expectoration. The roentgenogram, Fig. 7 revealed bilateral diffuse pathology, which was diagnosed miliary tuberculosis on x-ray. Repeated sputum examinations were negative for tubercle bacilli but cultures were positive for Monilia. Potassium iodide was given and the patient made rapid improvement.

The fourth roentgenogram, Fig. 8, was made July 7, 1936, and shows a recession of the acute pathology. The silicosis, however, has passed from

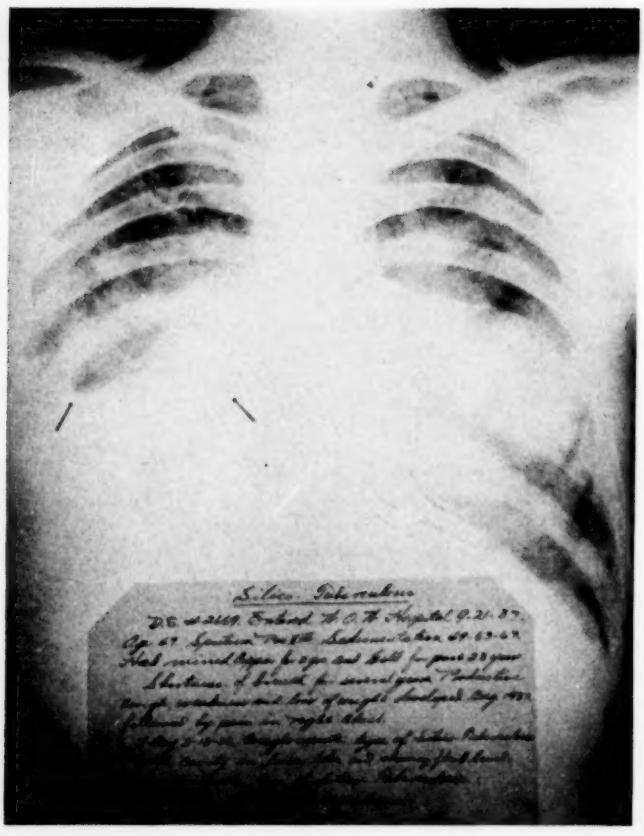

Fig. 3.

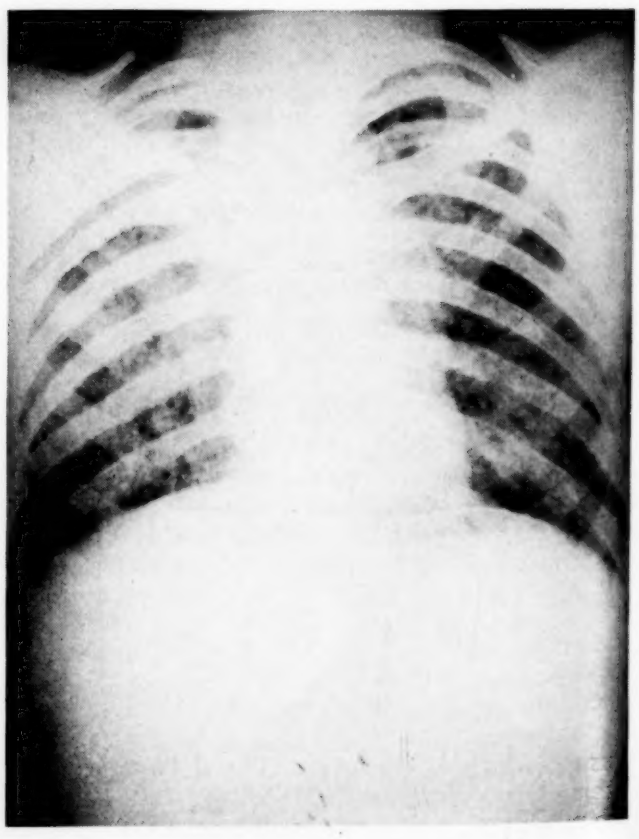

Fig. 4

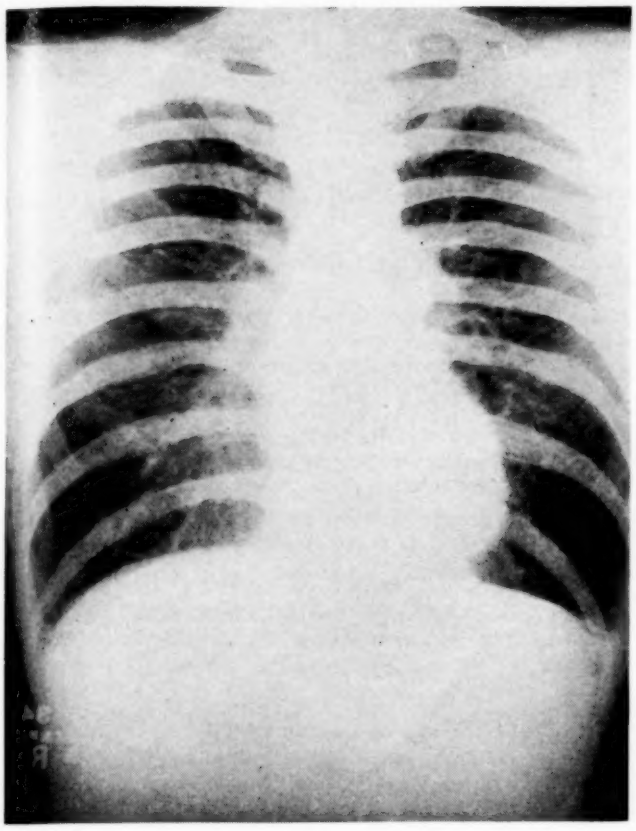

Fig. 5.

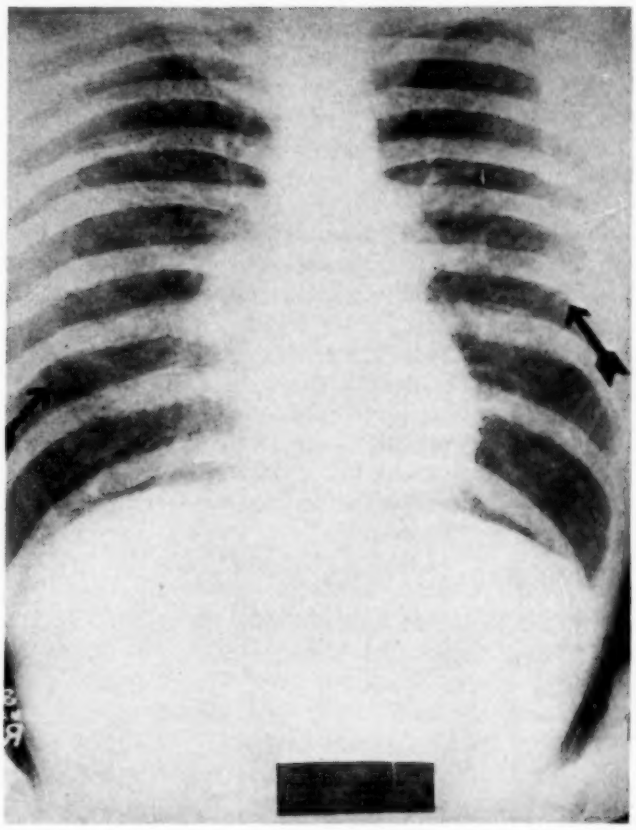

Fig. 6.

the first to the second stage. The calcified nodes, characteristic of Monilia, can be seen between the middle and outer thirds of the lung fields.

The interesting feature of this case is the change from first to second stage silicosis as a result of the acute respiratory infection, and the diagnosis of miliary tuberculosis after the onset of infection. Such a diagnosis would hardly have been

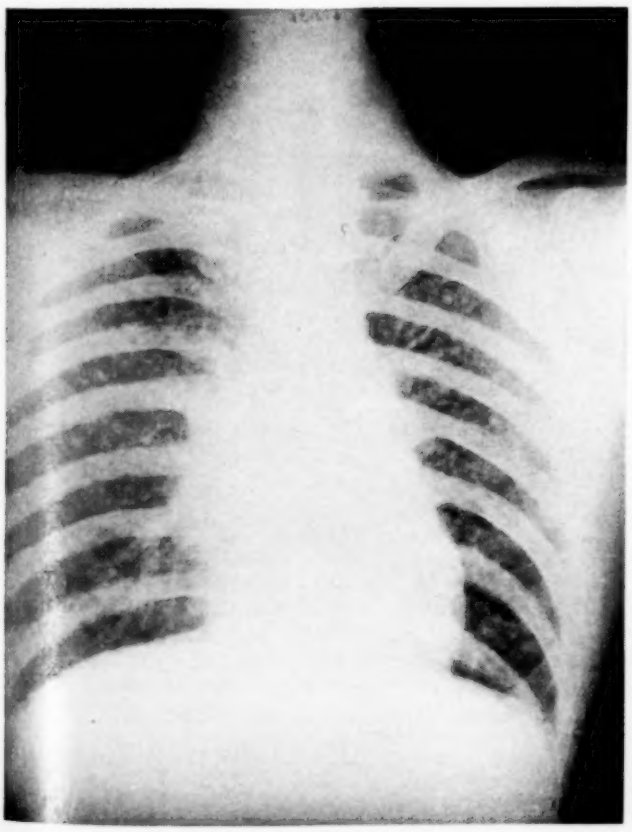

Fig. 7.

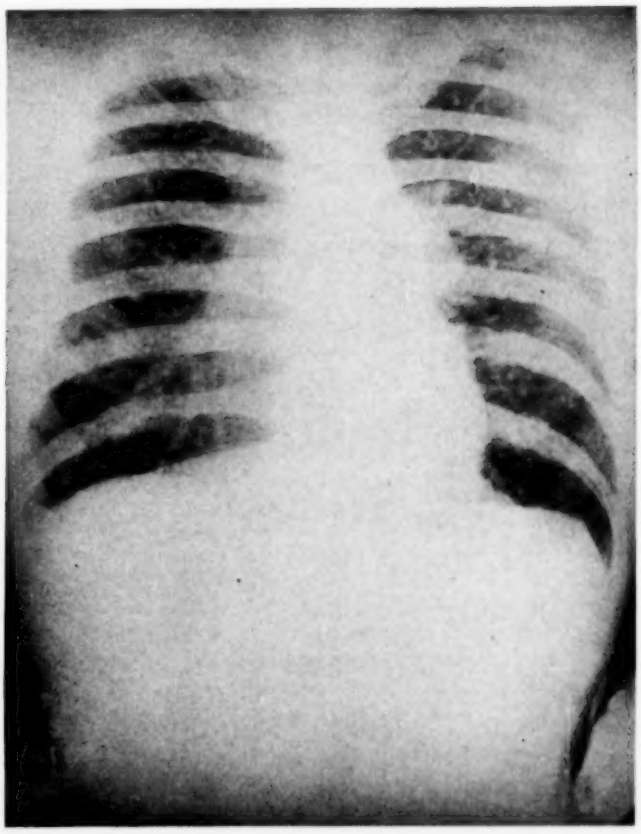

Fig. 8.

made if the history and laboratory procedures had been considered.

(The authors acknowledge their indebtedness to DR. W. W. GAY, El Paso, Texas, for the history and x-rays of the latter case.)

Prognosis

THE prognosis for uncomplicated silicosis is favorable if the workman is removed from the offending dust before extensive nodulation develops.

Even those cases complicated by tuberculosis will respond favorably if treated properly.

Once the nodules begin to coalesce, however, the outlook becomes more grave, and the disability progresses rapidly.

Treatment is of little value if either of the conditions is advanced.

Legislation

TWENTY-ONE States now have Workmen's Compensation laws, and eight others have appointed commissions to study the problems of compensation legislation. An increasing number of claims are being filed each year, and it is probable that all of the industrial States will soon have statutes governing occupational disease disabilities.

In general, the laws already passed provide for partial and total disability on the same plan as for disability due to accidents. A few States, however, make no provision for partial disability due to silicosis. Too, there is a wide variation in the time allowed for filing claims after exposure and in the length of time one must be employed before disability can be claimed.

Conclusions

SILICOSIS is an important problem of industrial and preventive medicine.

2. The diagnosis of silicosis, tuberculosis, and other chest conditions may be confusing without proper evaluation of history, physical signs and symptoms, x-ray, and laboratory tests.

3. There is an increasing demand for uniform and equitable laws governing working conditions and compensation for disability.

4. Pre-employment, periodic, and post-employment physical examinations are essential to the proper administration of disability laws and to determine the merits of claims.

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Third Annual Symposium

THE Department of Industrial Medicine of Northwestern University Medical School is conducting its Third Annual Symposium on Industrial Disease and Hygiene on September 25 and 26, 1939, at Thorne Hall on the Chicago Campus. The program is as follows:

Monday Morning, September 25, 1939 — 9:00 A.M.

Chairman—DR. PAUL STARR, Assistant Professor of Medicine, Northwestern University Medical School.

NON-TUBERCULOUS PULMONARY DISEASES

I. "Clinical Aspects," by DR. ERNEST E. IRONS, Chairman of the Department of Medicine, Rush Medical College.

II. "Radiological Aspects," by DR. HOLLIS POTTER.

Discussion by DR. ROBERT C. BLOCH, University of Chicago; DR. HENRY SWEANY, Municipal Tuberculosis Sanitarium; DR. E. B. NEFF, Deere & Co.

Monday Afternoon, September 25, 1939 — 1:30 P.M.

Chairman—DR. WILBUR E. POST, Clinical Professor of Medicine, Rush Medical College.

KIDNEY DISEASES OF MID-LIFE:

I. "Clinical Aspects," by DR. HERMAN O. MOSENTHAL, Clinical Professor of Medicine, New York Post-Graduate Medical School of Columbia University.

II. "Pathological Aspects," by DR. J. P. SIMONDS, Professor Pathology, Northwestern University Medical School.

Discussion by DR. EDWIN F. HIRSCH, St. Luke's Hospital; DR. FRED FITZ, Chicago Tribune; DR. R. J. DEMOTTE, Pullman-Standard Car Manufacing Company.

Tuesday Morning, September 26, 1939 — 9:00 A.M.

Chairman—DR. EDWARD OLIVER, Associate Professor of Dermatology, Rush Medical College.

"Soap—A Cleanser and an Irritant and Its Role In Occupational Dermatitis," by DR. JAMES HERBERT MITCHELL, Associate Professor of Dermatology, Rush Medical.

Discussion by DR. L. F. WEBER, University of Illinois Medical School; DR. CLEVELAND WHITE, Northwestern University Medical School; DR. B. B. REEVE, Standard Oil Company; DR. K. K. JONES, Northwestern University.

WELDING — GAS AND ELECTRIC

I. "The Relative Importance of the Health Hazard," by DR. EUGENE L. WALSH, Fellow in Medicine, Northwestern University Medical School.

II. "The Protection of Operators," by DR. JAMES A. BRITTON, Associate Professor of Medicine, Northwestern University Medical School.

Discussion by DR. SANFORD GIFFORD, Northwestern University Medical School; MR. WARREN A. COOK, Zurich General Accident & Liability Ins. Co.; DR. H. A. VONACHEN, Caterpillar Tractor Company.

Tuesday Afternoon, September 26, 1939 — 1:30 P.M.

Chairman—DR. M. HERBERT BARKER, Assistant Professor of Medicine, Northwestern University Medical School.

COMMON BENEFICIENT USES OF POISONOUS METALS AND ALKALOIDS — ECONOMIC IMPORTANCE AND HEALTH HAZARDS

I. "Lead and Lead Alloys in Industry," by DR. MARCUS A. GROSSMAN, Director of Research, Carnegie Illinois Steel.

II. "Control or Elimination of Health Hazards in Manufacture and Use of Ledloy," by DR. A. G. KAMMER, Medical Director, Inland Steel Company.

III. "Metallic Salts and Alkaloids in Agriculture," by RAY HUTSON, Dept. of Entomology, Michigan State College.

IV. "The Protection of the Health of the Grower, the Handler and the Consuming Public," by PROFESSOR W. A. RUTH, Department of Horticulture, University of Illinois.

Banquet Session:

Blackstone Hotel, 7:00 P.M., September 26, 1939.

Chairman—DR. J. H. CHIVERS, Chairman, Board of Governors, Department of Industrial Medicine, Northwestern University Medical School.

Toastmaster—DR. IRVING S. CUTTER, Dean, Northwestern University Medical School.

"The Past and Future of Preventive Medicine," DR. WALTER L. BIERRING, Commissioner, Iowa State Department of Health, Des Moines, Iowa.

Injuries and Tumors

—*Of the Spinal Cord*—

Walter E. Dandy, M.D.,
The Johns Hopkins Hospital,
Baltimore, Maryland

OF THE two fields which I shall discuss today, doubtless the treatment of fractures of the spine will interest you the most, but it is in this field that we have less to offer and certainly the results are less brilliant than in the treatment of tumors of the spine.*

There is a great deal of discussion, and has been for many years, on what is the best form of treatment of spinal injury. I refer only to those injuries in which the spinal cord has been damaged, not to the spine itself. Just as we are interested in injuries of the head from the standpoint of what happens to the brain, so we are largely concerned in spinal injuries with what happens to the cord. If the cord is not damaged, the treatment of the spine itself is a matter of relatively little concern. It is a matter of traction; it is a matter of placing the patient in a cast to maintain position or get a better position and to reduce pain, which is quite severe with most spinal injuries. But when the cord is damaged, then our problem is a very severe one. There is an old maxim that goes about as follows: Injuries of the cervical region live a day; those in the thorax a week, in the lumbar a month. Of course, that is far from the truth. In a general way, however, the cervical injuries of the cord are the most severe of all; thoracic less and the lumbar least.

Our treatment when surgery is indicated, and it is indicated only at times, might be limited. Probably too much surgery is done for spinal injuries, but on the other hand our judgment of what has happened to the cord and what remains of function is none too secure from the best evidence we have, so there is quite a margin for error in determining when to operate and when not to operate. On the whole, because spinal operations are relatively without danger, except in cervical injuries — and in these I make a very quick operation — I believe that operation itself upon the spine elsewhere is attended with so very little risk to life or function that when one is in doubt, the patient should be given the advantage of that doubt, with the assumption that function remains in the cord and the removal of any pressure that may exist. One does not like to use surgery unless there are very positive indications, and rarely does one operate from a negative standpoint.

INJURIES to the cord occur in two or three ways: first, from dislocations of the cord; second, from compression fracture which presses upon or destroys the cord, and third, from some comminuted fracture which cuts or lies upon the cord. One cannot tell from a neurological examination just which of these conditions obtains, but one can tell very well from the study of the x-ray of the alignment of the vertebrae and whether the cord is compressed in any massive way from malalignment or whether there is any fracture of the laminae that are pressing upon the cord. That is our best evidence of gross lesion along the cord indicating surgery. In the cervical region most of the injuries are due to rapid dislocation of the vertebrae. The vertebrae slide one on top of the other and quickly slide back again as the force of the blow is released, and there may be and usually is no malalignment of the cord whatever. X-ray shows a perfectly intact vertebral column, and if you do a Queckenstedt's test that will usually be found to be entirely negative. In this rapid dislocation the spinal cord is usually cut or compressed from the rapid stretching. Many of these cases have been operated upon and usually the cord is cut through and in others the superficial appearance does not look so far from the normal, but the inner or white matter has been mashed to a pulp. Although the exterior looks quite normal, still the cord has been destroyed within and there remains only soft, necrotic tissue. Rarely, then, will an operation upon the cervical region be wise, and that rare occasion is when there is definite deformity which shows in the x-ray.

Cervical injuries are dangerous to life because of their proximity to the medulla. Most of them occur at the fifth or sixth vertebra and edema of the cord, which proceeds to the medulla, causes a very rapid rise in temperature. Your patient may seem to be quite well but his breathing is rapid and difficult, his pulse is rapid, and his temperature, which is the best index of all of the severity of the process, continues to climb, reaching 106°, and death will follow frequently during the first night. It is not advisable to do anything to these patients for it adds to the rapidity with which these edematous sequelae ensue and you are merely hastening death. If the temperature subsides, you know that the danger to life is lessening and the patient may recover but the vast percentage are going to die very quickly.

In the thoracic region of the cord the injuries are usually compressed fractures. The thorax is well protected by the ribs so there is no dislocation, and it is there that our greater number of patients are probably correctly subjected to operation. Here again the x-ray helps.

The same is true in the lumbar region; below the first lumbar vertebra in the lumbar region we have roots of the spinal cord that are peripheral and may be injured quite severely with recovery, whereas where the cord itself is injured little if any recovery of function is possible. In injury to the cord there will be edema so you may think there is complete destruction, but when the edema subsides function returns through the part of the cord that is still intact.

I feel that if in the thoracic or lumbar regions there is an indication of a reduction in size of the spinal canal by x-ray or from the Queckenstedt test that the patient should be given the advantage of the doubt and that region uncovered by operation. If you accomplish something in a few cases

* Read before the Congress of Railway Surgeons at the Palmer House, Chicago, September, 1938.

it is worth while, because nothing else will bring these patients relief from the compression.

The time at which any operative interference is made is most important, and I think very strongly the sooner the better, because the continual presence of any lesion pressing the cord might produce permanent injury and it is in these cases that real palliation results. Many surgeons feel that the Queckenstedt test is an indication for or against operation. It is not a very safe method. It is not safe in spinal cord tumors where it is used with more frequency, so I do not feel it is quite fair to depend upon a test that is not absolutely safe. If the surgery is going to accomplish anything it should be done early.

One of our most important indications for operative treatment, when there seems to be on examination a compression of the cord, is the degree of paralysis that has resulted and the time at which that paralysis has resulted. If the paralysis comes on immediately and is absolutely complete from the time the patient is first seen, you can be almost certain that there is nothing that any operation can accomplish because the cord is then completely severed. If, on the other hand, at your earliest examination you can find some evidence of function remaining below the lesion, there is evidence that the cord is not completely cut and that much of the neurological disturbance may be due to edema. Those cases should have operative treatment. Lumbar injuries should be explored more frequently than thoracic because we are dealing with peripheral nerves. Peripheral nerves can be sectioned and will reunite whereas if you wait until a neuroma has formed, restoration of function is impossible. These are the cases in which, if there is anything to be offered and unless there are indications to the contrary, the cord should be uncovered. The maximum has then been offered to the patient.

There is one other lesion following trauma which I shall speak of in connection with spinal cord tumors, and that is vertebral disc rupture.

THE diagnosis and treatment of tumors of the spine is a brilliant field, one with very little mortality because spinal operations are not dangerous. It is a field in which the diagnosis can be made with almost perfect precision. You can be certain with very few exceptions that you are dealing with a tumor, and where that tumor is located. If there is a tumor, you can localize it precisely and that, of course, means that your operative attack is precise. One might suspect that tumors of the cord were in their general characteristics very much like those of the brain, both being nervous structures, but from experience there is very great difference. About three fourths of all spinal cord tumors are encapsulated, removable and permanently curable. That percentage does not hold in the brain. The vast percentage of brain tumors are infiltrating myomata, so that right off, instead of dealing with 25% of tumors curable, we are dealing with 75% that are curable and at practically no risk.

How do we diagnose tumors of the spinal cord? First, of course, it is necessary to suspect tumors when we have symptoms referable to the spinal cord. There are four great groups of signs and symptoms that are frequently adequate to make a diagnosis and even to localize a tumor absolutely. Then we have accessory methods of examination which complete the diagnostic story and make practically a 100% diagnosis and localization. One of the important disturbancse, of course, is pain and backache. Not all tumors give pain and backache but many of them do, and when it is present it is important; you can frequently tell by the type of pain, and the position of the pain, where that tumor lies and even the kind of tumor.

Why does the patient have backache? It comes from a lesion which causes intraspinal pressure; it restricts the spinal canal, obliterates the fluid-containing spaces and presses against the vertebra. One point is almost pathognomonic, i.e., that the pain is better when the patient is standing or sitting, worse when recumbent. I have seen patients who could not lie down who were even thought to have a cardiac lesion condition. This finding is characteristic of spinal tumor and the reason is that with the backbone in the upright position, one vertebra sits upon another and you get the maximum volume in the spinal canal. If the patient bends the back and restricts the space, that produces pain and so the best position is sitting or standing.

The next type of pain is the root pain; this is a sharp, lancinating pain like the pain of tabes. It is a pain that is usually unilateral, lasts for a short time, disappears and then returns in the same place. That is because a root from the spinal cord to the vertebrae is pressed by this tumor. Unless you evaluate this pain, the patient may be operated upon for various types of conditions, such as appendicitis, kidney conditions, pleurisy, etc.

Then there is the pain of hyperesthesia. At the level of the tumor there is sometimes a sufficient pressure upon the nerve roots to produce an hyperesthesia and later anesthesia, so you may get a band around the waist or chest; and such a band is almost pathognomonic — it means that those nerve roots are compressed by a tumor.

The last type of pain goes down the back of the legs and is usually bilateral; it varies from time to time but maintains its distribution. That is due to the pressure of the tumor upon the sensory columns in the spinal cord.

If one correctly evaluates these pains, it is of very great importance in the early diagnosis of a tumor.

What are the next signs and symptoms for which we look? There is the motor weakness below the level of the tumor; that is not accurate for localization. Above all is the sensory loss. Below the level of the tumor there is a reduction in sensation which, as we study carefully, will be found to end at the upper level on one or both sides, and that upper level means the level of the tumor. That is our most important guide for the diagnosis and localization of the tumor. Then there are the reflex disturbances: increased reflexes if the spinal cord itself is involved; reduction in the reflexes if

the cauda equina is affected. If you get an absent Achilles reflex, it suggests a lesion in the lumbar region affecting the cauda equina; if there is an increased Achilles, it cannot be the cauda equina. The loss of bladder and rectal control may first be manifested by stoppage of urine and eventually an overflow; there is also lack of control of feces. One of the important sensory findings is a saddle anesthesia over the buttocks, and when you get that it means that the tumor is in the lumbar cord. You can miss this finding unless you particularly look for it.

There is another group of symptoms which is very important. The Brown-Sequard symptoms mean a loss of motor power on one side and loss of sensation on the other side of the body below the level of the lesion. If you get changes of sensation on one side and changes of motor power on the other side, then it is evidence of a tumor.

Unfortunately there is one condition more common than tumors which is frequently confused with a tumor, and that is multiple sclerosis. In its typical form it is easy to differentiate, but there are many cases of borderline type in which you cannot be certain whether there is a tumor or multiple sclerosis, it is then necessary to call in the accessory methods of examination: lumbar puncture, Queckenstedt test, lipiodol injection. When one has symptoms referable to the cord, one wants to look for symptoms in the brain: difficulty in vision such as blind spells; difficulty in swallowing, and nystagmus. If you have those, you have multiple lesions and it is very probably multiple sclerosis.

It is those cases that are difficult to diagnose and differentiate. The Queckenstedt test, as I said, is an important test. If in doing this test there is no shift in the height of the fluid in the tube, it is evidence that you are dealing with a block and that block is a tumor. However, you can have tumors that do not completely block and those may give a negative Queckenstedt test, so it is not an absolutely sure sign; it is then advisable to use lipiodol (0.5 cc.). Then take an x-ray and you can see the lesion on the x-ray plates. This is an absolute test of a tumor and its location. If the lipiodol goes to the bottom of the canal you do not have a tumor but are probably dealing with multiple sclerosis. Lipiodol should be used discreetly and in small amounts. I have never seen harm result from it, but it is not a thing to use unless it is needed. That applies to all tests. Of course the fewer you have to use on a patient, the better.

The examination of the spinal fluid is important. You may have a colored fluid or a little increased protein, which may be evidence of a tumor.

At the present time lesions of the intervertebral discs are only diagnosedwhen sciatica develops and then it is necessary to inject lipiodol to determine the location. In most cases they are in the lumbar region.

These are nice lesions to treat. They recover completely, even when paralysis has resulted. This is true of all spinal tumors. The patient may be completely paralyzed but in the course of three weeks he can walk out of the hospital.

Discussion:

DR. LOYAL DAVIS, Chicago: I think DR. DANDY has given a very excellent summary of two very interesting subjects, upon part or all of either one of which he could easily have spent the entire afternoon. It is not an easy thing to talk about injuries of the spinal cord and tumors of the spinal cord and compress one's data down to a few minutes. Therefore, I think he is to be complimented on the way in which he has covered these two interesting subjects.

We are in complete agreement with him when he points out the difference between cervical, thoracic and lumbar injuries of the spinal cord so far as prognosis is concerned and I think there is no use in dwelling on any analysis of that. But there is one thing I should like to emphasize because it is very important. I am sure that no one by neurological or physical examination can differentiate between the symptoms of a complete anatomic section of the spinal cord and a complete physical section or compression of the spinal cord. There is no way of telling, when the symptoms are those of a compression, whether or not the cord is sectioned or severed because the same group of symptoms may be present simply by pressure on the cord. We have seen that, of course, in tumors or fracture dislocation in which the cord is compressed. I think that is extremely important because we very frequently see cases in which something might have been done surgically, particularly in the thoracic and lumbar regions, and simply because there were symptoms of complete lesion at the time the patient was first seen, the patient has been told the cord is severed and there is nothing to do. I do not believe that symptoms of complete section of the spinal cord should be made an indication against surgery.

Incomplete lesions of the cord are entirely different. When one has symptoms of incomplete lesion due to injury of the cord, as DR. DANDY has pointed out, one should certainly wait and avoid surgery because in the presence of recession of symptoms and improvement one should leave that cord alone, since anything that one does only adds to the trauma and edema that are present.

I think it is difficult to say what the surgical indications are. Every case is a problem in itself of diagnosis and judgment. If one has to make a definite statement of indications, then certainly the signs of x-ray compression, in other words a mechanical compression of the cord and presence of block in the subarachnoid space, may constitute a surgical indication.

There are exceptions, of course, but dogmatically speaking, as the general rule those hold pretty well because, after all, there is nothing that a surgeon can do about an injury of the cord. You cannot sew it together and you cannot put back the pulp and traumatized tissue. All you can do is to remove mechanically that which compresses the cord, so that it is a mechanical problem.

DR. DANDY has called attention to the presence of paralysis of the bladder in these cases. There are numerous ways of taking care of this. Many urologists disagree with the neurologic surgeon, and many neurologic surgeons disagree with one another. Personally, I feel that the bladder should not be allowed to overflow. The bladder under such circumstances is under pressure and the muscles and fibers are being distended; it is just the same as allowing a wrist drop to exist so that function never comes back. I think the same applies to the bladder. It is our custom to put in a retention catheter, to leave it in a week or 10 days, change it; wash out the bladder and put it in again, and this time put a clamp on it. We do not allow the urine to run into a bottle, but we put on a clamp and open that clamp every five hours in an attempt to establish automatic function. There are men who feel that a suprapubic cystostomy should be done because it is a well known principle that an injured spinal cord does not do well in the presence of infection.

DR. DANDY has said that tumors of the cord are very interesting. I think what he said about the number of cases remaining undiagnosed should be emphasized again, because the pain of the tumor is mistaken for pain of

some other disease. That is because you are not thinking cord tumors. It is simply because we do not keep in mind that this pain may be due to spinal cord tumor. As DR. DANDY said, one may start with simply the examination of the reflexes or of sensation and arrive at a localized diagnosis vertical within the spinal cord and still the vertical is the most important position from a practical standpoint, so it is not a difficult matter to arrive at this diagnosis, particularly when there are other accessory methods of diagnosis, as x-ray and the Queckenstedt test.

I was particularly interested in DR. DANDY's remarks about ruptured nucleus pulposus, because that certainly is a very definite clinical entity. It should be of definite interest to you who deal with cases of trauma, because it is frequently present in a patient with severe pain in the back radiating down the leg without a definite history of trauma causing it. It has been shown that the pain with absence of Achilles jerks is usually most frequently sign of the presence of a ruptured nucleus pulposus. I am not so sure that the cases are as common as we might be led to believe from the reports in the literature recently; it may be that I have not encountered so many, but they are a clinical entity and under those circumstances more of them will appear than have in the past.

DR. HOWARD D. McINTYRE, Cincinnati, Ohio: I would like to thank DR. DANDY for a very precise presentation and I have very little to add to it, except that there are a few points that could be emphasized.

As to the Queckenstedt test I think that sometimes harm can be done by doing that test in the clinic where the surgery is not to be done. I have been guilty of that and usually now, after I make the diagnosis, I refer the patient directly to the surgeon and have him do the test because I have seen an exaggeration of the paralysis and exaggeration of the symptoms — making the patient a poorer risk for operation if the Queckenstedt test is done and surgery postponed too long after that.

Another thing I should like to mention is that cord tumor is not a rare disease. I remember being associated with an older neurologist who was not tumor conscious and he made the diagnosis only a few times. Since I have practiced alone, I have made the diagnosis at least 35 times in the last five years.

Another thing I should like to call attention to is the sudden onset of symptoms sometimes observed in cord tumors. We get the idea that it is usually a long drawn out thing, but I have often seen it when the symptoms came on after muscular exercise. One boy's complaints were of paraplegia 24 hours after lifting a steel pole without any pain after that, but operation showed a dural epithelioma of the cord.

Of course, early diagnosis is the thing to be stressed, and if we are more conscious of this condition we would make more early diagnosis than we do. Every patient I see who complains of pain causes me to think of tumor until I prove it is not present. I had a patient upon whom DR. DANDY operated; this man had been to a number of doctors and was being treated for arthritis and neuritis and then he came to me. You could make the diagnosis merely from the history: he said he had pain on coughing and sneezing, pain back of the neck down to the thumb. Eventually it was proved that he had a tumor, with a positive Queckenstedt test and increased protein in the spinal fluid without sensory symptoms and a hyperesthesia and a slight swinging of the scapula. Lipiodol showed complete block. That was the earliest case I have ever seen, and he got a perfect result.

As to the disc lesions, I think they are very infrequent. It is the same problem as tumor. One thing I should like to say is that the disc condition may go a long time with exacerbations and remissions. One patient had a history going back 20 years with exacerbations and remissions, and he had two episodes of foot drop, one of which cleared up and the other he came to me about. The diagnosis was made and he was subsequently operated upon. Another interesting thing about these lesions is those seen in private practice get very much faster relief than those in compensation cases.

DR. RALPH G. CAROTHERS, Cincinnati, Ohio: I should like to relate one experience with a cord tumor. I saw this boy just about an hour before I was leaving on a vacation and I made a diagnosis of scoliosis, put him in a frame and put on a plaster jacket, and the result was that he had that jacket off pretty soon. Then it was demonstrated that immobilization in a case of cord tumor caused considerable increase in pain. I explained that to myself on the ground that immobilization did not permit him to move around and relieve the pressure.

If I may have the audacity I will take issue in one respect and that is the belittling of bone lesions in spinal injuries. I see a great many more injuries with a bone injury and without cord lesion. It is perfectly sickening to have these chaps with compression fractures of the spine arrive at the doctor's without any diagnosis having been made. They are just as bad off from an economic point of view as the man with his cord cut. I think there are 100 bone lesions to one cord lesion and we must become conscious of these bone lesions because there are many of these cases in which no diagnosis is ever made except lumbago.

DR. WALTER E. DANDY, (in closing): I did not, of course, mean to belittle the injury of the spine. That needs treatment, but that is in the hands of the orthopedic man and when the cord is not involved we let them take care of it.

I want to re-emphasize the two points that DR. MCINTYRE brought out. One is the risk of lumbar puncture. Lumbar punctures are not so simple as you may be led to believe. They are dangerous to life, to the cord, and to function. I have seen patients come in from a doctor's office, have a lumbar puncture made, for the diagnosis and have paralysis below the neck, with both arms and both legs paralyzed, and that is what is going to happen. Those are the dural tumors and what happens is that you reduce the differential pressure. You remove the fluid below the tumor and the pressure above jams the tumor against the bare spinal cord. It is a very harrowing procedure, and when the lesion is in the cervical region it reduces the patient's chances of recovery. The other point that DR. MCINTYRE made is one that we see often, and that is that coughing and sneezing produce paralysis and may be the first sign of tumor or may come on during the progress of the tumor. That is due to the same feature. It is due to the pressure that produces this injury, to the tumor pressing against the hard bone. One cannot overlook those two great diagnostic points.

Treatment of Burns

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THE treatment of burns has developed within recent years on a more fundamental basis.* When Davidson[1] introduced the tannic acid treatment, the problem was considered essentially one of toxemia. Observers first believed that tannic acid would precipitate the broken down tissue material and prevent its absorption, however, this has since been disproved because systemic changes are manifested in spite of this and other methods of treatment.

A knowledge of the general as well as local manifestations of burns is essential to properly care for these conditions.

There are three stages of reaction following a burn: The first, and by far the most important.

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* From the Department of Surgery, Emory University School of Medicine, Atlanta, Ga. Presented at the Forty-Second Annual Meeting of the Association of Surgeons of the Southern Railway, Washington, D. C., June 14, 1939.

is that of shock. The second is called the toxic stage, although the existence of toxins[2] has never been proved. The third is the septic stage, which is so rarely seen when the patient is treated by the tannic acid method. The first and second stages are the most important, and death rarely occurs in the third period.

The pathological changes in the first group are those of secondary traumatic shock, namely, a hemoconcentration associated with decreased blood volume and cardiac output. The extent of these effects is directly proportional to the amount of fluid loss which takes place primarily in the tissues and from the burned surface. When the body is unable to maintain a water-balance mechanism, the blood chlorides pass into the tissues, leaving the total blood serum chlorides decreased. As a result of these changes, the cells of the various tissues are early affected. The oxygen deprivation of the tissues results in varying degrees of necrosis. In fatal cases almost complete cellular destruction may occur.

During the past eight years[3] there have been 1706 burns in the Emory University division of the Grady Hospital, all of which were uniformly treated with tannic acid. Accurate clinical and laboratory findings were recorded in each instance which afforded an opportunity for an evaluation of this method.

THE first consideration in treatment is to administer sufficient opiates for the relief of pain. The initial dose of morphine to a severely burned adult is one-half grain. Treatment of shock is begun which consists in giving infusions of normal saline, gum acacia and blood transfusions as soon as suitable donors are available. When the patient has reacted from the shock, which sometimes lasts two to three hours, local treatment is instituted. The proper preparation of the area is most essential for successful results. All clothing and loose skin are gently removed and the surface cleansed with norma saline and some mild non-irritating antiseptic. This procedure can best be carried out by placing the patient in a tub of warm water or saline. The tannic acid is now applied by means of a large spray, using 5% solution in 1:10,000 merthiolate.[4] The time required for the formation of an eschar can be lessened by the application of 10% silver nitrate on a swab after the initial spraying of tannic acid.[5] The patient is kept underneath a light cradle to maintain body temperature without the necessity of covers. The coagulum is not disturbed in the very superficial burns until healing has occurred, which usually requires about two weeks. In the deeper burns, especially when infection is noted, the covering is gently removed and treatment of the infected wound is begun. All suitable cases are grafted when the infection has been controlled. During the second stage it is essential to maintain a chloride, water and protein balance. Transfusions are given repeatedly during this period.

The mortality for this series of 1706 burns is 4.8%. It is essential to consider all burns serious when one-third body surface is involved regardless of depth. The greatest opportunity for reduction of mortality occurs in the border-line cases which are not considered serious on first examination. At the end of 24 hours in untreated minor burns evidence of dehydration, chloride loss and toxic changes are manifested. Irreparable damages are then present which increase both the mortality and morbidity.

The application of tannic acid lessens pain and shock, decreases the fluid loss and diminishes infection—all of which materially aid in the reduction of mortality. If the skin and subcutaneous tissues are destroyed, regeneration is impossible without the formation of considerable scar, regardless of the method of treatment. An earlier writer has defined a burn as an "infected wound caused by heat." With the proper use of tannic acid this description is incorrect for superficial burns. When tannic acid is placed on an improperly prepared surface, an infection will develop beneath the coagulum. This further increases the tissue destruction and prolongs the morbidity.

The increasing incidence of burns has been attributed to many causes, notably those arising from industrial hazards, changes in social and economic conditions, increased population and motorization. Since the working classes are most exposed to industrial hazards, there is a greater prevalence in this group than ever before. At the Henry Ford Hospital[6] 45% of the lethal burns occurred in children under six years of age. Our mortality in the same age group was only 30%. We found that 12.1% of the mortalities occurred in patients past 60 years of age. Thus, there is about an equal number of deaths in the so-called extremes of life and the middle group.

THE mode of production of burns depends directly upon the different age groups. Burns in adults, as a rule, are caused by the open flame and in children by scalds. In general hospitals by far the greatest number are due to the open flame. There was 59% incurred by this method. Scalds, which are thought to be more fatal than burns from the open flame, were next in number with 20.4%.

The number of skin-grafts is an index as to the depth of the burn or the degree of infection. One hundred and twenty-five cases in this series were grafted. This percentage would probably have been more with other methods of treatment because tannic acid lessens infection and permits early healing. Deep burns should always be grafted rather than be allowed to heal with extensive scar formation which increases disability and permanent loss of function. The late bad results in burns can be attributed to the failure to replace the lost tissue with grafts. These results are contractures and sensitive scars which easily become irritated, ulcerate and perhaps later become malignant.

A review of the 82 mortalities presents much interesting information. There were 14 deaths within 12 hours after after the accident. The major-

ity of the fatalities took place between the twelfth hour and the fifth day, when 49 deaths occurred. There were 19 deaths in the series which occurred after the fifth day. The longest period of survival was 55 days. Fatal complications such as pneumonia, nephritis and sepsis were decreased after the fifth day. These results prove the common belief that if an individual survives the first few days of a burn, the prognosis is good.

Various methods have been used to determine the seriousness of a burn. It is usually considered that one-third of the body surface involvement in an adult and one-seventh in a child, regardless of the depth, is likely to prove fatal. By Berchow's method[7] the average percentage of involvement in this series was 40. The smallest was 6% in a 21 year old man who died on the fourth day from lobar pneumonia. The greatest surface involvement was 90% in a 40 year old man who died in eight hours.

There were 38 in the series who had more than 40% surface involvement. The percentage mortality for this group was 46.3. This very high rate is contrary to many reports. It is, therefore, believed that by careful attention to this group the mortality can be reduced. One patient recovered after having 60% skin surface destroyed. This was a child eight years of age with second and third degree burns. It is noteworthy that the only systemic manifestation was a mild hemoconcentration occurring in the first 48 hours.

The greatest care must be exercised in treating patients with less than 20% body surface involvement. In spite of present general knowledge, treatment in this group usually consists in the immediate application of an unguent dressing without recognition of the general changes which may develop.

A fatal issue can frequently be avoided in this group by adequate general care and local attention to the wound.

Discussion

A STUDY of this series of burns reveals the many problems of treatment. It was believed by some of the earlier enthusiastic supporters of the tannic acid method that most of the problems would be solved by its use. The recent interest in the development of the tannic acid, gentian violet and other types of protective treatment of burns has been of much value. The greatest benefit is due to stimulation of interest in detailed general care.

Underhill,[8] Blalock,[9] and others have shown that in extensive superficial burns there is an increase in hemoglobin and red blood cells with a lowered arterial pressure similar to that seen in histamine shock. Due to an increased permeability of the capillaries the blood plasma passes rapidly through the walls into the tissues leaving the red blood cells and hemoglobin concentrated. The extent of concentration is thought to be 140% before partial asphyxiation of the tissues occurs as a result of inefficient oxygen transportation. This may account for all the pathological findings.

The immediate prevention and recognition of these changes will decrease the early mortalities and lessen the late complications. Davidson[10] and Underhill[8] have shown that one-third of the blood chlorides can be lost without evidence of depletion. Hypertonic saline and blood transfusions are more capable of maintaining an adeuate blood volume by the prevention of further osmotic activity with extravasation of fluids into the tissues. Hypertonic saline replaces more rapidly the lost blood chlorides by decreasing the tissue edema.

In spite of education and improvement in living conditions among certain classes of people there continues to be an increase in the number of burns. The majority in children occur in the poorer classes and this probably will continue to constitute a large number. It is noted that a greater percentage is occurring in the working man. Only one-third of the mortalities occurred in children under six years of age which is very satisfactory considering the increased incidence at this period.

The occurrence of the majority of the deaths between the twelfth hour and the sixth day is probably due to the development of the manifestations of shock. It is extremely important to prevent or lessen these effects in the initial treatment. Tannic acid aids in reducing the number of deaths after six days by lessening the amount of infection and the prevention of delayed sepsis and its complications.

The common belief that burns with one-third body surface involvement are serious is verified in this report. The average body surface involved was 40%.

In extensive superficial burns, it is doubtful if the mortality can be appreciably reduced regardless of the method of treatment.

The treatment of burns is difficult due to the extensive changes which develop in all vital organs.

Careful clinical and laboratory investigation should be made in each case to determine the extent of these effects in order to institute the type and amount of systemic therapy.

Without detracting from the benefits of tannic acid and other agents of this type diligent general care remains the most important treatment of burns.

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The Problem of Medical Service

—*For the Small Industrial Plant*—

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THE problem of medical service for the small industrial plants, those under 500 employees which employ 62% of the workers, is not a new one and I do not wish to leave the impression that a cure-all scheme is herewith presented.* In fact I have no new ideas on the subject. Industrialists, physicians, and particularly insurance carriers, have dealt with this problem for many years and in varying degrees of thoroughness. Time, however, has permitted considerable education of all concerned, and, with the broader concept of what constitutes *health conservation* in industry, it would appear that certain desirable measures in this connection might now be much more easily effected. A resume of problems and procedures and a reiteration of certain proved principles in this connection would, therefore, seem in order.

The problems of medical service for the small plants are the same as those for the larger industrial organizations except in the following points:

1. *There is an unwillingness or an indifference* on the part of most of the employers of small groups of workers to include *health conservation* as a valuable or a necessary part of their operation. With them medical service is yet a repair job as contrasted to the plans for *health maintenance* which are now so widely in effect or being introduced among the larger establishments. Since the average worker loses approximately nine to 10 days per year on account of illness or injury, and since less than one day of this absenteeism is caused by accidental injury and occupational disease it is time that we discontinue shooting only at the smaller target and attack the health problem in industry as a whole. Reports to the National Safety Council show that injury frequency and severity rates are higher in the small plants than in the large plants, and it is generally conceded that the medical service of most of the small plants is inadequate. We shall consider therefore that an adequate medical service for the small industrial plant should be one of health maintenance and health promotion —just as it is in the larger plants—and it should include:

(a) Pre-employment and periodic physical examinations of all employees.

(b) Efficient care of all industrial injuries and occupational diseases.

(c) Participation in the control of all health hazards.

(d) Reasonable first aid and advice for employees suffering from non-industrial injuries and illnesses while on duty.

(e) A cooperative working relationship with the plant management and with the local medical practitioners and other indicated health agencies. By "other indicated health agencies" we mean such as in the case of a needy employee where it might be necessary, if he should have no private practitioner, to cooperate with some charitable agency. Beyond that, there are other organizations interested in health, such as our State Departments of Health and the U. S. Public Health Service.

2. *The relatively high per capita cost entailed* in providing adequate medical service in small plants on an individual basis makes the employer feel that he cannot afford or justify this additional cost. There is no debate about the fact that per capita medical costs increase as the number of employees in a plant decreases. It is very difficult for some and impossible for the great majority of small plants to absorb the fixed overhead costs of individual medical departments and service.

3. *There is a lack of organization* among groups of small plants to make available adequate medical service at reasonable cost. The medical service of the small plant is largely that which is provided by the insurance carrier. It is curative in type, and continuity of service is often lacking due to the fact that a change of insurance carrier usually entails a change of plant doctor. While curative medical service alone is considered obsolete let us not be too critical of the insurance carriers. They have made a splendid contribution to the safety movement and have done well in the industrial medical field considering that in many States their medical responsibility ceases with the provision of medical care for the injured and the payment of such bills. Insurance carriers as a group have never openly endorsed pre-employment and periodic physical examinations of employees, but with the enactment of occupational disease laws many carriers have refused to insure certain risks without such examinations and other health measures being instituted.

A number of years ago when we advocated these programs to include preventive health measures, as well as the repair of industrial injuries, we were told by a number of leaders in that work that we had missed the boat entirely, that what was needed in this country, so far as industrial medicine was concerned, was better care of injuries, better treatment of fractures, more honesty, less padding of doctors' bills. That did not worry me very much. It seemed like somebody was in a rut in that respect.

Common Problems

DR. LOYAL A. SHOUDY, at the recent Congress on Industrial Health of the American Medical Association, voiced the need for better doctors in industry. This implies the need for attracting to industry those who are already

*Presented at the Twenty-Fourth Annual Meeting of the American Association of Industrial Physicians and Surgeons, Cleveland, Ohio, June 7, 1939.

qualified to do this type of work and the greater need of building for the future by educating and training more adequately the medical students and the recent graduates during their years of internship and residency.

Notwithstanding the fact that the curriculum in the medical school of today is crowded with essential subjects it is felt that each medical school should include a course in industrial medicine. This course now being given by a few medical schools should be of such scope and extent as to give the student a general working knowledge of the problems at hand and procedures in their solution. It is not necessary to make every medical student a specialist in industrial hygiene or occupational disease. The incidence of occupational disease as compared to that of accidental injury and other illness is so small as to make it unwise to make the undergraduate training in occupational disease too extensive. There is a need, however, for competent occupational disease consultants in the various industrial communities, but the training in this specialty is best acquired in post-graduate study.

In this machine age the need for more surgeons skilled in the surgery of trauma is urgent both inside and outside of industry. The worker is confronted with no greater problem in this respect than is the private citizen, and recently there is considerable evidence that the worker has been receiving better surgical care of injuries than has the average citizen.

"Industrial surgery" is not a specialty and the term is a misnomer. Industrial surgery is simply a phase of the surgery of trauma. Dr. Harry E. Mock has estimated that one fourth of the surgery of the average general surgeon consists of traumatic surgery. Fortunately many more qualified surgeons will be available throughout the country in the very near future, owing to the additional graduate training programs of two to three years or more in general surgery (surgery of trauma included), and the surgical specialties now in effect or being instituted by hospitals and medical schools largely at the instigation of the American College Surgeons and the various American Boards of Surgery. Now with the high requirements of the American College of Surgeons and the various American boards for certification or fellowship, in the colleges, these training programs of two or three years or more are being effected and, naturally, that is going to distribute a larger number of surgeons all over the United States who will be better trained in surgery.

Despite extensive training in medicine and surgery there are some private practitioners who do not apply their knowledge and skill to the best advantage in industry. Through a lack of interest and information they do not seem to acquire an understanding of industrial health problems, they do not institute preventive health measures, and, not infrequently through an inadequate knowledge of causal relationship, the physician precipitates or paves the way for unjustifiable claims and lawsuits. In order to aid in correcting this situation the medical director of a large industrial organization is now contemplating giving a training period, including a course in industrial hygiene, to residents in local hospitals as part of their training while in residency. This would give them a training period of anywhere from two or three months in the industrial plant itself. That does not mean they are going to turn out competent industrial hygienists by any means, but they will be put to work, and they will adopt an industrial viewpoint, and will get a much better perspective of the problems that will confront them. If a number of other large industrial organizations did likewise there would soon be a larger number of physicians and surgeons scattered throughout the country who would be better qualified to serve industry.

A number of competent physicians and surgeons have declined offers of industrial work because the working relation between the industrial or insurance management and the physician were not pleasant or the remuneration was inadequate. With respect to unpleasant working conditions the fault may have been on both sides, but obviously if industry wants a good medical service the remuneration therefor should be commensurate. The payment of one dollar for a lengthy physical examination including a urinalysis could hardly be called adequate remuneration, and it should be further realized that the cutting of legitimate charges will too often be followed by prolongation of treatment and other padding of fees.

ADDITIONAL methods for effecting adequate medical service for the small plants are:

1. Educating the employers as to the desirability and the benefits—such as increased efficiency of production, reduced labor turnover, reduction of accidents and absenteeism, lowered compensation and sick benefit costs—that they may derive from an adequate health service, and making the employers realize that it is their responsibility primarily to effectuate such health programs. This educational work will require a continued and a cooperative effort from the American Association of Industrial Physicians and Surgeons, the American Medical Association, the American College of Surgeons, the U. S. Public Health Service, the National Association of Manufacturers, the National Safety Council, insurance carriers, and others interested in improving the health of the worker and his working environment.

2. Educating the employees as to the benefits that they may derive from a program of health maintenance. Workers in general cooperate very well if the medical service is efficient and unbiased. The trouble we might have with labor is probably some situation which has been handed down, when our medical service was more of a defensive type and was not unbiased. We have noted that whenever we put efficient medical

service in, the interest of the employee comes first, and such troubles as opposition to physical examination and the free choice of physician vanishes. If such is the case the questions of "free choice of physicians" and "opposition to physical examinations" become of no importance.

3. Furthering a cooperative working relationship between the medical profession and the insurance carriers. The insurance carriers are now and will continue to be very important factors in the medical set-ups of the small plants. If the representatives of these groups will discuss their problems around a conference table not only will their problems and differences disappear, but constructive action may also be expected to follow.

4. Promoting the group service principle in which the doctor *qualified in this type of work*, and the nurse, serve a group of small plants. Now when we say, "qualified in this type of work" we mean a doctor actually interested in this work. Selection of a doctor just because he is a nephew of the superintendent of the plant or he belongs to the same golf club should not be the basis of selection. As an employer, we should select doctors who are competent in industrial medicine and are interested in the work. If they are not interested in their work, they are just looking for a means to add to their income, they are going to do work not only in which they cannot take pride, but neither can the employer take pride in such work turned out by the doctor. By thus pooling the costs, the benefits of an adequate medical service can be made available near or at the place of work at a price that is not prohibitive. Large industrial organizations can provide good medical service at annual per capita costs ranging from $5 to $10. Smaller plants may find their costs for similar services around $10 to $15 per employee on a pooled basis, but even the latter cost should not be a deterrent. One company with which I am familiar spend $27 on each pre-employment physical examination, and the management feels that this thorough examination is "good business." DR. GLENN S. EVERTS has demonstrated that a plant of 100 employees could provide a so-called minimal medical service consisting of a one hour a week visit by the physician and also by the nurse for an annual per capita cost of approximately $10, but that the time devoted by the physician in such a minimal plan was inadequate. DR. EVERTS based his estimate of cost there on charging at the rate of $4.00 per hour for the doctor's visit and at the rate of $1.25 per hour for the service of the visiting nurse. We do not want to leave the impression that that should be the scale of employing a doctor. Different communities, of course, will have different levels of fees. The National Association of Manufacturers has recently estimated the cost of equipment and construction of a two-room dispensary suitable for a plant having 200 employees to be $300, and a similar dispensary for 200 to 500 employees, $425.

How is the group service plan to be actively promoted? DR. EVERTS stated that representatives of the Philadelphia Health Council made approximately 900 interviews with about 50 firms in order to get 10 companies interested in providing medical service along lines of the group idea. Should the individual physician actively and openly solicit the small plants for this type of work he would be charged with unethical conduct. County medical societies can hardly set up demonstration projects which would be in competition with some of its members. Possibly continued education of the employers will cause them to assume leadership in this direction, but judging from the Philadelphia experience their response will be slow.

5. Cooperating with the private medical practitioners of the community and other health agencies when indicated. No medical service or health program can function at its best or to conclusion unless this is done. Undoubtedly the plans for health and hospital insurance now being effected will make it possible for many needy workers to correct their physical defects, which are elicited by the industrial physician in the course of pre-employment and periodic physical examinations.

What are you going to do when you find an employee with a gall-bladder involvement; how is he going to remedy this? You are going to have to refer him to his private practitioner, if he has one. Many will be needy and cannot afford to have this done. Therefore, I say that the health maintenance is largely nullified, but at the present time there are plans for health and hospital insurance for non-industrial conditions which might be the key to that solution. It may mean that the needy workers can correct their physical defects in that way.

Now, that is a little beside the point, to say that. What business have we got mentioning health insurance? We are in industry. Nevertheless, we find that these plans are being sold to groups of employers of small plants and their employees all over the country, and at this time I would like to issue a little bit of warning. We find if a good thing comes along there are a lot of people willing to take advantage and commercialize it.

We find that there is a large number of groups and clinics and hospitals which offer these insurance plans to group of employees in industry which fall in the class of boarding house hospitals. It is obvious that these hospitals and clinics are so understaffed and inadequately equipped that they cannot render service to their insured.

I believe that industrial physicians serving these plants certainly should counsel with the management and the groups of employees to see that they are guided toward the insurance plans where they can get care—not only so that they obtain a reasonable latitude or an adequate latitude of choice of doctor and hospital, but also in order that they be assured of competent care.

Discussion:

DR. FREDERICK W. SLOBE, Chicago: DR. NEWQUIST has had a very unusual experience, in visiting cor-

porations all over the country. Our experience, of course, has been confined to the actual care of the employees of the corporations. We are sort of jacks-of-all-trades in that respect; but it is interesting to me to note that our conclusions coincide with his at practically every point.

The lack of social consciousness he mentions, or medical consciousness or awareness, you might say, of the small corporate groups is probably present in about nine out of every 10. It is a very sad commentary, but it is true. There are some notable exceptions, but I think they are merely the exceptions that prove the rule.

This does not apply so much in the small corporate groups in the small cities, or the small communities, where there is more of a family atmosphere. I think it applies to the greatest extent in the large industrial centers, where there is a more impersonal relationship between the management group and the employees.

Since we practically agree on this existing lack, what is the remedy going to be? DR. NEWQUIST has gone into the most important phases of that—since, in order to find the remedy, of course we have to know the cause. He has mentioned practically all the important causes. The economic status of many of the small companies today is doubtless a definite factor in most of them. Employers are uncertain; they do not know what will happen tomorrow, or next week, or next year; and under those conditions they are rather skeptical about embarking on any plan that is going to cost them more money, even though it may have a valuable long range effect.

But at the same time I do not think that is the major cause, because I am sure we have all noted that many small concerns, even though quite prosperous, do not seem to have a more social attitude, or be medical-minded any more than some of the others who are in less advantageous circumstances.

The question of insurance carriage is, of course, important, because of the habit that many small concerns have of feeling—as soon as they have an insurance policy written or have pre-employment examinations, and perhaps a few x-rays taken under compulsion—that their duty has been done, and that there is nothing more to do. This is not the fault of the insurance carrier. It is the fault of the plant itself.

The underlying cause, however, we must describe as only one thing, and that is just plain ignorance on the part of management. The cure, must be, as DR. NEWQUIST emphasized, education.

The doctor who services the plant is really under very great difficulties in this educational campaign. If he makes a point of going in and suggesting this and that, I am afraid his motive in many cases will be seriously questioned. It may be thought, for example, that he is probably trying to increase his income from that particular plant.

The question of inadequate compensation due to competition, the price-cutting of fees, is a very practical and serious problem in most of the large industrial centers. Much can be done, I think, to alleviate that.

I believe that the only way to correct these things is not really from without—that is, through the doctor who is servicing a number of these plants in one group or in one locality, but must be by burrowing from within, by reaching management directly, through contacts and sources which he finds to be unimpeachable and which he will listen to.

Such talks as MR. WILLIAMS gave the other night are very profitable, and we profited by his. But the people who need those talks the most are the corporation presidents, boards of directors, and stockholders. Had some of them been there to hear MR. WILLIAMS they would have profited a great deal.

The same thing applies to the possibilities in the work that DR. HEISER is going to be able to do. He is going to make an inspection tour of the medical care in industry under the auspices of the American Manufacturers Association. They will listen to him because he is being sent out for that purpose.

It is thus, for the most part, a matter of getting the proper perspective and vision developed in the managements of the smaller industrial units, so that they will think less of the profit motive at the present time.

A lot of talk is being indulged in nowadays about the dangers of dictatorships and the ultimate probability of inflationary disaster, all of which may have a very great bearing on the future of many things. I am not arguing against the dangers of either or both of those, but if businesses, large and small would think a little less about them for a while, and possibly also think a little less about the profit motive, and put men to work, I think prosperity would come back of itself and the American way would persist!

Current Comment

— *Data on Industrial Dust* —

EMERY R. HAYHURST, M.D.

ALTHOUGH the recent hysteria in regard to silicosis and other occupational diseases seems largely to have passed, the storm has not blown over.* Compensation is still in its infancy and can be expected to grow by leaps and bounds. At present, 46 States and the District of Columbia have compensation acts, with 22 of them covering occupational diseases in some form of legislation. Thirteen states and the District of Columbia appear to cover silicosis, and many other states have occupational disease legislation under consideration. Probably within five years comparatively broad or inclusive occupational disease legislation will be on the statute books of nearly every State.

Hence the far-sighted industrialist should "put his house in order" by studying his hazards and promptly applying known remedial measures. Unquestionably the most important will pertain to the occurrence of dust.

While the laws and regulations apply largely to silica dust with resultant silicosis, its harmful feature is the very finely divided form and relatively large quantities breathed rather continuously for a long time. However, experts look askance at high concentration of any kind of dust and such has already been recognized by the courts. PROFESSOR PHILIP DRINKER, noting that there is no satisfactory medical answer to dust at the present time, states that the engineer is making a bad mistake if he lets man breathe heavy dust concentrations of any material. The courts and compensation boards are not impressed with subtle distinctions between dusts with 10% and 40% quartz, especially when medical experts are reluctant to make definite statements regarding such differences. "The evidence that excessive dustiness of any kind is harmful is beyond argument."

The harm of dusts is not necessarily confined to the lungs as there must be considered also the nose, throat, and bronchial passages and indirectly the effects on other organs as well as the external effect on the eyes, ears, and skin including the relation to perspiration, likewise the seriousness of reducing visibility and, further, the matter of explosive dusts and detrimental effects on property.

* By D. Harrington, U. S. Bureau of Mines, Information Circular 7074, May, 1939. 9 pages, mimeo.

It would seem logical for the industrial executive to disregard technicalities and concentrate on the reduction of dust in the air at his plant instead of splitting hairs as to the size, kind and quantity, or scores of other uncertainties as to dust. The answer to some of these questions will probably never be available.

It must not be thought that large particles which can be seen floating in air are harmless, as they may clog air passages and permit easier access of fine dusts to the lungs. "Any atmosphere in which dust can be seen by the naked eye is too dusty . . ." (Obviously the matter of the amount and type of illumination enters here. The reviewer has repeatedly called attention to the value of a strong beam of light in the practical estimation of the amount and behavior of suspended dust, also the likelihood that amounts continuously in excess of that customarily occurring in nature may cause harm.) After visible dust has been removed it may still be necessary to investigate invisible dust, by means of precision instruments.

In industry, some release from dust troubles can be solved by using manufacturing practices. processes, or equipment that tend to obviate dust. (The reviewer would comment on the frequency with which hoods and vents plainly pictured in equipment catalogues have been left out of the purchase of essential manufacturing units mainly because they added a few more dollars to the purchase price.)

The present article proceeds further into the methods of controlling dust in factories, and underground work, the merits and shortcomings of dust traps, the fact that ventilation runs second as a rule to wet methods for many industries, but, at the same time, the difficulty of using wet methods in such work as tunneling and metal mining. The shortcomings and virtues of wet methods, good blasting practice and miscellaneous dust prevention procedures are given special consideration. The New York State regulations on control of toxic gases after blasting in mines, tunnels, and shafts are considered excellent.

The chief use of dust respirators is for excessively dusty atmospheres but, for a number of reasons, they are usually undesirable for constant wear throughout a working shift. They give no protection against poisonous or asphyxiating gases. Instead, the best protection against dust is reduction of its quantity at its source. Vacuum cleaning is commended, for various relations.

Physical examination of workers should be a principal cog in the machinery of operation, and should be repeated at intervals not exceeding 12 months, possibly six months.

The author concludes that the prevention of dust disease is chiefly an employer responsibility which he should not hesitate to shoulder, not only to safeguard the health of persons but also to avoid the financial burden of compensation. This does not mean that the employee should not help himself but, again, this is very much a question of education and the rendering of information in understandable form.

—*Occupation and Health*—

THIS is the second* of the biennial series of brochures published as a Supplement to "Occupation and Health," the first having been reviewed in INDUSTRIAL MEDICINE, September, 1938, p. 592. There are 11 brochures under the present Cover (No. 2) which we review as follows:

1. ANTHRACO-SILICOSIS OF ANTHRACITE MINERS, by DR. R. R. SAYERS, 12 pages: Historical introduction, plans for the survey (in Pennsylvania), study of working environment, medical survey, summary of medical findings, correlation of dust exposure and evidences of pulmonary changes, and bibliography. There are included seven figures and three tables. This is a concise statement chiefly based upon Public Health Bulletin, No. 221. It may be said to be the most complete exhibition we have at present under the title.

2. BRUCELLOSIS, by PROFESSOR D. OTTOLENGHI (Naples), 9 pages: This disease which, it is believed, has existed since ancient times, was identified at the end of the last century. It is taken up in orderly manner under the sub-hearings: Etiology, epidemiology, statistics, symptomology, diagnosis, treatment, prophylaxis, compensation, and bibliography. World-wide coverage is given.

3. CONSTITUTIONAL FACTOR AND OCCUPATION, by PROFESSOR G. PIERACCINI, (Florence), 9 pages: The author states that this problem is still in the initial stages of elucidation. He develops the subject along the lines of three fundamental types of human morphology: *Normal-lined,* having distinctive variations as the *long-lined microsplanchnic,* and the *short-lined microsplanchnic.* The first represents the human group best equipped with organic defense against all causes likely to damage the system. These three types are encountered in all human races and are distinguished by the form of the body, organic metabolism, and functional activity. There are sthenic as well as asthenic types of both the long- and short-lined. The relations of these to occupational hazards are discussed at length, including a number of mixed- and sub-types. It is concluded that "It is possible in general to speak of a maximum and minimum aptitude for work, but judgment must always remain to some extent relative."

4. FLOURINE COMPOUNDS — HYDROFLUORIC ACID, FLUORIDES, FLUOSILICATES, etc., by DR. KAJ ROHOLM (Copenhagen), 7 pages: Chemistry, forms of poisoning, local corrosion, acute poisoning, chronic poisoning (fluorosis), possibilities of intoxication, hygiene and prophylaxis, legislation, and bibliography. Two tables accompany. The article, while technical, is comprehensively covered in relation to both water supplies and industries.

5. INDUSTRIAL NOISE, by DR. R. CAUSSE (Paris),

* Supplement, International Labour Office, 730 Jackson Place, Washington, D. C., 500 pp. (when completed). $5.00, including loose-leaf binding cover.

10 pages: Definition, measurement, analysis of noise, influence of noise on the system, types of occupational deafness, noisy trades, prophylaxis, legislation, and brief bibliography. "As regards working capacity, it should also be remembered that a worker suffering from deafness can often continue his working career in a noisy trade, but not in any other."

6. NICKEL CARBONYL, by ARTHUR J. AMOR (Glydach), 5 pages: Brief chemical introduction, toxiciyt, pathology, morbid anatomy, symptoms, general symptomology, diagnosis, treatment, prognosis, preventive measures, legislation, and bibliography. This is a rare form of poisoning due to carbon monoxide compounded with metals (note the Mond process for refining pure nickel) and has commercial importance in iron carbonyl. Carbonyls are highly toxic whether injected or inhaled as a gas.

7. PIG-BREEDERS' DISEASE (Eruptive Meningotyphus), by PROFESSOR G. PENSO (Rome), 6 pages: This disease, observed first by the present author about 10 years ago, is an infection of strictly occupational type, being exclusively confined to those who engage in the breeding of pigs fed from waste from the cheese-making industry. It has been reported chiefly about the Alps and in Italy in the Plain of the Po. The disease is characterized by an infectious feverish state and a cyclical evolution with an incubation period of 15 to 30 days followed by a sudden onset of symptoms. Despite the gravity and the dramatic character of symptomology, prognosis is usually favorable. The mode of transmission is still unproved but there appears to be no contagion from man to man.

8. PNEUMATIC TOOLS, by DR. L. TELEKY (Vienna), 12 pages: History dates back to the use of compressed air in French mines in 1839, but practical pneumatic tools were first produced industrially in America in 1883. The general troubles caused by the use of such tools was first described by Corsini in Italy in 1907, while the name of Loriga was early associated with the description of local derangements. The article discusses pathology in relation to vascular disturbances, injury to the joints, compression of the articular surfaces, injuries of the palmar aponeurosis and of the muscles and nerves, prophylaxis, legislation, brief bibliography, and an appendix of diseases due to hammering machines (with three references). The article contains several tables, one of which relates the years of working experience to the degree of injury.

9. SELENIUM, by DR. ALB. STASSENS (Brussels), 6 pages: This metalloid, identified by Berzelius in 1813 and very analagous to sulfur, has become of considerable importance recently in America. Technical data, uses, toxicity, pathology, analytical properties of selenium, and a brief bibliography are included. The article deals practically entirely with industrial relations, although mention is made of the affliction of rural populations of certain western parts of the United States in connection with foodstuffs. The symptoms resemble arsenic poisoning, having both acute and chronic manifestations. Dudley's table on industries, processes, and possible selenium hazards is presented.

10. SLATE, by DR. E. STREIGNART (Liége), 8 pages: Properties, industrial processes, sources of risk, statistics, pathology, hygiene, and bibliography. One table by A. Fiel, dealing with a French working community, shows the percentage for various causse of death among slate workers and other workers, and a second table, the mean annual death rate. The chief pathology is pulmonary. The whole radiographic picture from simple accentuation of normal markings through nodular forms to pseudo-tumoral pictures have been described in slate workers. Lumbago is also a frequent complaint of slate splitters. However, dust is the principal source of trouble.

11. TOXIC GAS (Individual Protection Against), by PROFESSOR L. DAUTREBANDE (Liége), 12 pages: This article is devoted to an account of principles which should be observed in the construction of anti-gas masks. These have undergone extensive development in recent years. Illustrations, charts, and tables accompany. The features of special interest are discomfort, harmful or "dead" spaces of the mask, and resistance to respiration as well as the question of arrest of aerosols. A number of brief experiments are described with emphasis on physical relations and adaptations. The experience is practically all European and the result of special studies by the author himself.

The above 11 brochures comprise approximately the second 100 pages of the Supplement of 500 pages announced.

— *Wisconsin Physical Examination Program* —

MUCH concentrated thought has been given by the Wisconsin Industrial Commission to the subject of the physical examination of industrial workers. This is contained in a declaration of principles and the report of a joint advisory committee which was assisted extensively by a medical sub-committee, all of which are covered in the present bulletin.*

The physical examination program is "designed to aid in the control and prevention of occupational diseases and accidents and to promote industrial health."

In a foreword signed by the three Commissioners (Mr. Voyta Wrabetz, Mr. Harry J. Burczyk, and Mr. C. L. Miller) the statement is made that "it has long been recognized that physical examinations play a part which is second only to engineering control." "Recognizing this fact the Industrial Commission of Wisconsin collaborating with the Industrial Hygiene Division of the Wisconsin State Board of Health, and with the splendid cooperation of industry and labor, has designed an examination program for Wisconsin Industry."

* Reprinted with permission by the Employers Mutual Liability Insurance Company of Wausau, Wisconsin.

We think the Commissioners are correct in venturing the statement that this is the first venture of this nature presented by a public agency. It is recognized that perfection has probably not been achieved in the present draft, and that undoubtedly questions of policy and procedure will need revison from time to time as the program is applied in actual practice. It is the hope of the Commission that industry and labor and insurance carriers will sincerely endeavor to follow the plan as outlined and submit suggestions and criticisms to the Commission as they may arise. "It is hoped that through engineering control and the medical control outlined in this plan, Wisconsin may achieve first rank nationally in occupational disease prevention and control as it has in its industrial accident prevention program."

The declaration of principles concerning physical examinatons in industry recognizes that the fundamental issue is conservation of public health as an obligation of both central and local governments in which the destiny of individual health is controlled and supervised from before birth to after death. Already, in many jurisdictions, a prerequisite to a marriage certificate is a compulsory physical examination, and among other procedures are examinations of members of the army and navy, firemen and policemen, and similar public officials—all recognized in the interest of public wefare; likewise, the stringent standards of rigid pre-employment and periodical physical examinations prescribed by government authorities where the safety of the public is at stake, as in the operation of railroads and airplanes. These and other considerations have formed the basis for an extension of the principle for the safety of employees in industry. The effectiveness of engineering methods for controllng and safeguarding health and welfare of workers is made possible only by equally effective and enforceable methods of medical control.

Mass employment means that the safety of many is frequenty entrusted to the hands of one or two employees, and new processes of hazardous nature require that workers' safety and health be not jeopardized by ill health or impairment of fellow employees.

With the adoption of compensation legislation for industrial accidents (1911) and industrial disease (1919), the Wisconsin legislature recognized the need for such medical control. Certain enactments (of which three sections of the Wisconsin statutes are reprinted) by the legislature recognize that any plan of medical control must be designed upon the sole background of public welfare.

From these premises, the Industrial Commission of Wisconsin proposes the following standards of procedure and practice as a statement of princples concerning physical examinations in Wisconsin industry:

"1. The scope of all pre-employment and periodic physical examination of workers in Wisconsin industry shall be outlined by the Department of Hygiene of the State Board of Health.

"2. All physical examinations are to be made by physcians selected by the employer.

(In the event of a possible grievance on the part of the examined employee, the industrial commission will on proper complaint in writing by the aggrieved employee or his representative cause an investigation to be made and if the grievance is found to be justified the employer shall cause all further examinations of such employee to be made by another physician.)

"3. All examinations are to be paid in full by the employer.

"4. All time loss occasioned by examinations made while the employee is in service is to be assumed in full by the employer.

"5. All transportation expenses occasioned by such examinations while employee is in service are to be assumed in full by the employer.

"6. All pre-employment examinations should be made prior to employment if possible. However, if because of uncertainty as to qualfications other than physical fitness a period of test employment is deemed advisable by the employer, such pre-employment examination may be delayed for a period not in excess of thirty days.

"7. All periodic re-examinations shall be made at the approximate time indicated by the examining physician at the time of the previous examination."

THE main body of the bulletin concerns the Recommendations of the Medical Sub-Committee on Physical Examinations in Industry (pp. 9-19). This committee was composed of Dr. A. W. Gray, Dr. E. B. O'Leary, Dr. O. A. Sander, Dr. Benjamin H. Schlomovitz (all of Milwaukee), and Dr. Paul A. Brehm, Chairman of the Industrial Hygiene Unit of the State Board of Health.

This committee was of the opinion that a program of this type should be of such broad scope as to cover all types of industries, and that physical examinations of industrial workers is the most important step toward a program of health service for industry. By such a program it is possible to obtain an evaluation of the physical status of employees and to observe that status by subsequent periodical re-examinations.

Perhaps no other factor is so important in the protection of health and physical well-being of the workers as the correction of defects discovered by such examination. Thus the health of a large portion of the adult population is advanced through this industrial procedure, from which improvement in the economic status of workers should result in the reduction of time and wage loss brought about by ill health and occupational accidents. Such examinations provide a service which, in most instances, would not be obtained voluntarily because of economic reasons. Further, it is the desire that placements may be made more intelligently so that work may be given to all who can possibly undertake it within their physical capabilities. It is the further hope that, through such a recommended program, physicians will make every effort to acquaint themselves

with the many health problems in industry so that decisions as to the physical fitness of workers may be made more conscientiously and intelgently. "There is need for enlargement of the scope of knowledge of the medical profssion on matters of industrial health."

ON the basis of these thoughts the medical subcommittee acted upon five questions submitted by the main committee as follows:

I. Scope of Examinations (Pre-Employment, Subsequent, and Periodic).

This provides also for different types of examinations for different types of employment.

A. *Pre-employment examinations*

These are advocated for all types of industries to include general physical examination covering the minimum or basic procedures. In addition, laboratory procedures include a chest x-ray (flat plate), blood serology for syphilis, urinalysis for sugar and albumen only, and blood examination to include Tallquist hemoglobin determination, and a cover-glass blood smear for a quick indication of red and white corpuscle content.

These provisions have especially in mind the control of tuberculosis and syphilis from a public health standpoint. Active cases of tuberculosis should be excluded as well as syphilis in the infectious stage. In regard to the latter, both the employer and employee are to be informed of the condition. "Syphilis in a non-infectious stage should not exclude an individual from pursuing his trade, but should certainly call for medical control."

B. *Periodic re-examinations*

These are to include the same procedures as for the pre-employment examination and made at two-year intervals. In industries presenting excessive hazards, examinations at more frequent intervals will be necessary, the same to be at the discretion of the examining physician. Where special laboratory procedures are required at frequent intervals, general physical examination will not need to be repeated each time but should recur at two-year intervals.

Where the x-ray does not demonstrate progressive lung pathology, the complete examination can be made at two-year intervals. The matter of more frequent chest x-rays is left to the discretion of the examining physician as well as the matter of more frequent general examinations. Sputum tests at frequent intervals are advocated in cases of questionably active tuberculosis, this procedure to apply in all industries regardless of the nature of the hazard. Stereo x-rays will also be necessary, but, as a routine procedure, a flat x-ray plate will be sufficient.

C. *Specialized procedures for different types of employment*

Recognizing that occupational hazards are so numerous and constantly changing that it has been almost impossible for medical knowledge to keep abreast of them and their ill effects, concerted effort is asked on the part of various research and clinical groups to obtain and disseminate specialized examination techniques to the medical profession generally.

"It is of greatest importance at this time to advocate a general program of physical examinations in all types of industry. It is advisable that a supplementary manual be prepared containing special diagnostic procedures and physical examination guides for the various specific industrial hazards."

II. Form of Reports to Be Made by Physicians Covering Such Examinations.

Two forms are presented in the bulletin, designated as A and B:

Physical examinations (A)

This form is to be retained by the examining physician and is to be used for pre-employment and periodic re-examinations. As printed, it provides for recording the usual identification data, occupational history and medical history, followed by a five column set-up. The left hand column provides for prospective employee or old employee, each to state his exact occupation and present complaints, below which are some 25 items to be reported upon for physical and laboratory findings. The second column, captioned "Original Examination" (with date), and each of the next three columns, captioned "Re-examination" (with dates) provide blank spaces for entering the findings. The foot of the blank provides a line for x-ray findings and recommendations, and another for the family physician's name, and date.

In general this form would appear to be adequate for the usual industrial physical examination but, in the reprint, the spaces provided for recording data are very much too small and we trust that the blanks provided will be roomy, since paper space costs much less than slighting of items for want of space.

Report of Examination (B)

The original goes to the employers and the duplicate to the employee.

This synopsis-form would appear to cover all that is necessary for the purposes intended, i.e., a summarizing statement of physical defects in general, vision findings, lung examination, suggestions and recommendations. The family physician, however, may obtain detailed report Form A upon request.

III. Whether or Not the Report Should Be Supplied in Its Original Form and Both to Employer and Employer.

It is recommended that the original examination Form A be retained by the examining physician and that no similar form be issued to either employee or employer, both of whom, however, are entitled to the information supplied upon Form B. The idea is to provide each party with sufficient information to enable him to act correspondingly and intelligently. Thus the employee is to be considered a personal patient and treated as such by the examining physician. The employee is entitled to a report of the important findings for the following reasons:

A. If found unfit for a particular occupation he has a right to know why, so that, if corrective

measures can be taken by medical treatment, he may be able to seek aid as soon as possible.

B. If found physically fit for a particular occupation but possessed of certain correctable defects, he has a right to know about them and to be advised by the examining physician to go to his personal physicial for treatment. The examining physician accordingly should ascertain the name of the employee's personal physician and inform the latter as to the nature of findings.

C. If found physically fit for a particular employment and no defects are noted, such a report should also be made to the employee.

The clinical judgment of the examining physician will determine the extent of information furnished to employers and employee. Likewise, the judgment of the examining physican will further be called upon when defects of a private nature are discovered such as venereal diseases, etc. When these diseases are discovered, treatment should be insisted upon either by the patient's prsonal physician or a public clinical agency when indigency exists. "State and local laws covering treatment of these diseases should be invoked if treatment is refused."

IV. THE USE TO BE MADE OF REPORTS IN COMPENSATION CASES COVERING INJURIES CLAIMED TO HAVE ARISEN FOLLOWING THE TIME OF EXAMINATION.

"Because of statutory provisions it is beyond the jurisdiction of this committee to prevent the admission as evidence in a compensation case of any examining physician's report."

V. WHAT CONDITIONS SHALL INFLUENCE EMPLOYMENT OR CONTINUATION OF EMPLOYMENT AFTER EXAMINATIONS MADE.

Here it is recognized that diseases, deformities, and disabilities are too variable in degree and extent to permit of a practicable schedule, so that the clinical judgment of the examining physician must control. "Roughly stated . . . the physician will find those applicants who are physically fitted for any occupation; he will find those who are fit for any work but have some minor and correctable defects; he will find those who because of certain physical defects must of necessity be limited as to occupation and who need medical supervision but not necessarily medical attention; and he will find those who because of disabilities will be unable to work and who will require medical attention. As examples of the latter individuals who will be disqualified for work are:" A. *Active tuberculosis;* B. *Syphilis* in its infectious stages, also syphilis of the central nervous system; C. *Communicable or contagious diseases;* D. *High blood pressure,* but only when associated with damaged heart or kidney function or both, and this to apply to strenuous work or to particular jobs where the safety factor enters (e.g., crane operators) and; E. *Serious defects of vision and hearing* in any hazardous employment or where the safety of others is concerned.

REFERENCE is made to the background provided in the report of the Wisconsin legislative committee appointed in 1909 to make an exhaustive study of compensation administration, and the subsequent legislation enacted in 1911 "to provides means of minimizing the number of accidents in industrial pursuits," and to the 1919 legislature which enacted the law granting compensation for industrial diseases, which "undoubtedly . . . felt this same object of prevention was as desirable in connection with diseases as it was in connection with accidents."

Two enactments are reprinted covering the duties of employers and of employees, respectively, to protect the life, health, safety, or welfare of employees and frequentors.

The advisory committee consisted of nine laymen, all residents of Milwaukee except MR. B. E. KUECHLE, of Employers' Mutual of Wausau. It took cognizance of informal conferences held during the fall and winter of 1937 and 1938 under the auspices of the Industrial Commission with representatives of industry and labor. In calling one of these conferences, the Industrial Commission made this statement: "The Industrial Commission has, therefore, thought it advisable to endeavor to now work out some uniform program which can be submitted to organized labor and which should have their unqualified approval."

It was also recommended to give widespread publicity to the report and urge all interested to give their wholehearted cooperation and, further, that the Industrial Commission appoint an advisory committee to be composed of representatives of labor, industry, and the medical profession to act upon any practice inconsistent with the plan.

The Periodic Examination

—*I. A Group Study in Diagnosis*—

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CONSIDERABLE impetus has been given in recent years to the idea of a periodic physical examination of the individual with a view of correcting whatever abnormalities may be encountered while they are still in the preclinical stage, or of establishing a hygienic routine which may be conducive to optimum health and function.* Despite its increasing momentum it is evident that the general population has lagged far behind industry and other similar organized institutions, such as educational and welfare, in putting that idea into practice. The reason for this may be found in the readier adaptability of groups to a recognized procedure, such as the periodic physical examination, once it is established. It is frequently a requirement for certain benefits and practices in some establishments. Not the least is the factor of expense which, in the group plan, can be reduced to an acceptable level. On the other hand, the inbred resistance of the average individual to a medical survey without some acute indication, as well as the failure of the gen-

* From the Medical Department, Macy Mutual Aid Association.

eral practitioner—admittedly the person of choice for such an examination — to encourage it and even to urge it, are probably the basic reasons for the present status of the "health examination" generally.

Criticism has, from the beginning, been directed at the examination as such, and its results held to be of dubious value particularly where no subsequent check-up of suggestions for the correction of defects was made. The more basic consideration of the examination itself, the accuracy of the various diagnoses made, or the failure to make them, as checked by the subsequent course, does not appear to have engaged much attention.

It is particularly of the examination as conducted in industry, with its necessarily limited time and facilities, that, one suspects, criticism may be most justifiable.

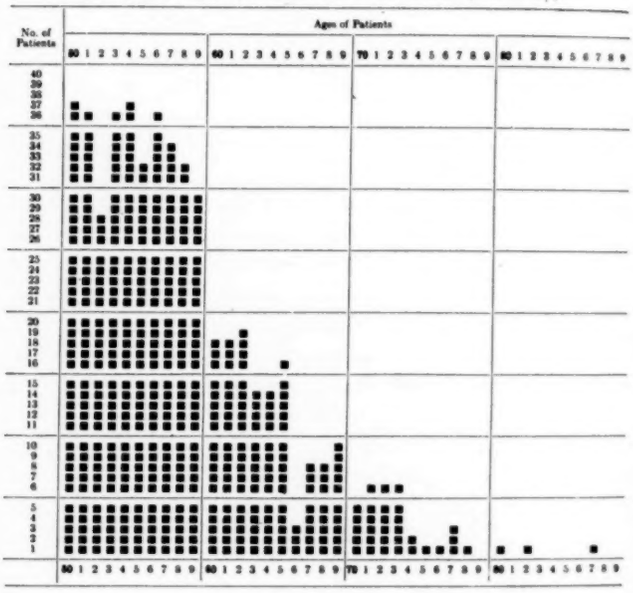
With this in mind it seemed desirable to survey the experience of a large department store with the periodic examination. Although all employees are subject to it after their second year of service, this study is limited to an unselected group of 500 who at the time were at least 50 years old. The primary question was: What would it reveal in regard to the diagnostic accuracy of a small group of physicians, of varied training and background, devoting part of their time to an industrial clinic? In a subsequent communication an attempt will be made to show to what extent their prognosis, as to the ability or disability of the examined employee to continue at work, is corroborated by the future course. Incidentally the data secured were expected to give some information in regard to the incidence of major physical abnormalities in this rather comprehensive group of workers who had reached their fiftieth year. A diverse group such as this may well be considered as a fairly representative sector of the general population and any conclusions applicable possibly to it also.

Before consideration of the data itself, a word in regard to the scope of the examination itself may be of value. The usually accepted clinic form of history and procedure is used, including urinalysis and hemoglobin determination and, more recently, a routine Wassermann test and chest roentgenogram. Where indicated, laboratory facilities are available for metabolic tests, blood studies, and general reontgenology.

It should be mentioned again that the patients constituting this study were unselected, the one exception possibly being the inclusion of all those who died during the period since the beginning of the examinations. Each patient, then, has had at least one examination. There was a total of 1493 performed, making an average of three per person, the maximum number being six.

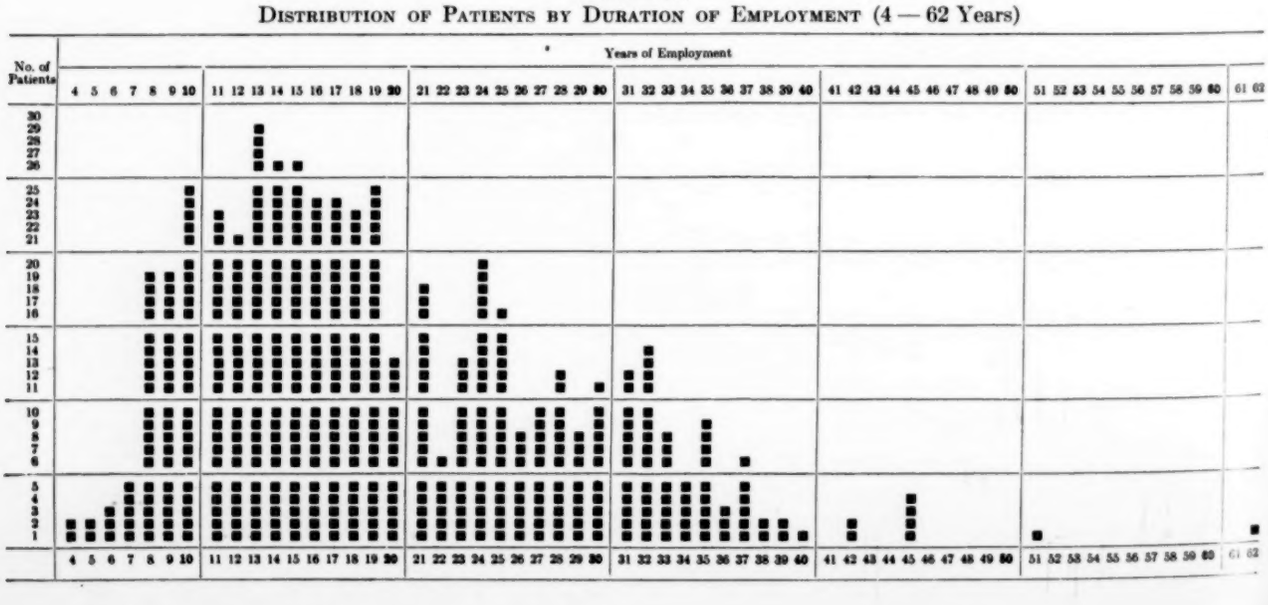
There were in this group of 500 patients 344 men and 156 women, ranging in age from 50 to 87 years, the actual distribution being shown in Table I.

TABLE I.
DISTRIBUTION OF PATIENTS BY AGE (50 — 87)



Their terms of employment extended from four to 62 years, more than half being in the 10- to 20-year period, as shown in Table II.

TABLE II.
DISTRIBUTION OF PATIENTS BY DURATION OF EMPLOYMENT (4 — 62 Years)



The occupations were of a most diverse nature, including the night floor-washer as well as the holiday Santa Claus. The distribution according to selling and non-selling work is seen in Table III.

TABLE III

	Men	Women	Total
Selling	46	63	109
Non-selling	298	93	391

In the non-selling group are included the heavier occupations, such as porters, loaders, maintenance men, cleaners, etc. Of these there were 93 men and 23 women.

Diagnosis

THE various diagnoses made in the entire group and their frequency are shown in the following:

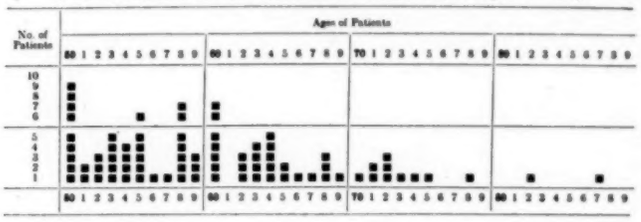
Acromegaly	2	Goitre, simple	3
Alcoholism	1	Gynecological:	
Anemia:		Fibroid	1
Pernicious	1	Hysterectomy	2
Secondary	13	Myomectomy	1
Arthritis	26	Oophrectomy	1
Carcinoma:		Pelvic plastic	2
Gastric	1	Hematuria	1
Oral	2	Hernia	57
Cardio-vascular:		Post-oper.	2
Angina pectoris	3	Hyperthyroidism	4
Aortitis	3	Malnutrition	15
Arteriosclerosis	74	Nephritis, chronic	12
C.C.V.D.	5	Suspected	1
Cerebral hemorrhage	1	Nephrectomy	1
Decompensated H.D.	4	Nephrolithiasis	1
Hypertension	148	Nervousness (functional)	5
Hypotension	7	Neurofibromatosis	1
Myocarditis (chr.)	74	Obesity	41
Potential H.D.	14	Osteomyelitis (chr.)	1
Tachycardia	1	Paget's disease	1
Dermatitis (occup.)	1	Peripheral neuritis	1
Diabetes mellitus	10	Phlebitis	1
Ear:		Psychosis (recovered)	1
Hearing defect	21	Pulmonary:	
Eczema	2	Asthma	3
Epithelioma	1	Bronchitis	3
Eye:		Bronchiectasis	1
Cataract	5	Emphysema	5
Visual defect	13	Pneumonia, post-	1
Fracture (old)	1	Tuberculosis	11
Gastro-intestinal:		Suspected	1
Cholecystectomy	1	Rheumatism	1
Gastrectomy	1	Sciatica	1
Rectal abscess	1	Senility	3
Ulcer	7	Skeletal deformity	4
Post-op. perfor.	1	Syphilis	10
Undiagnosed	9	Tabes dorsalis	1
Genito-urinary	1	Varicose veins (incl. ulcer)	25
Hydrocele	2	No diagnosis	134
Hyper. prostate	4		
Prostatectomy	1		

It should be noted that more than one diagnosis was frequently made in the same individual. Almost 30% of the total were found to have hypertension (systolic B.P. of 150 mm. or more as a standard). Chronic myocarditis, arteriosclerosis, hernia, obesity, and arthritis followed in order of occurrence.

Since the evaluation of the diagnostic accuracy is based in this study on the data obtainable from those patients who died since the commencement of the periodic examinations, the succeeding analysis concerns itself therewith. In this group were 63 men and 17 women, ranging in age from 50 to 87 years, whose employment age was from four to 62 years. (Tables IV and V.)

TABLE IV

AGE INCIDENCE OF PATIENTS WHO DIED (50 — 86)

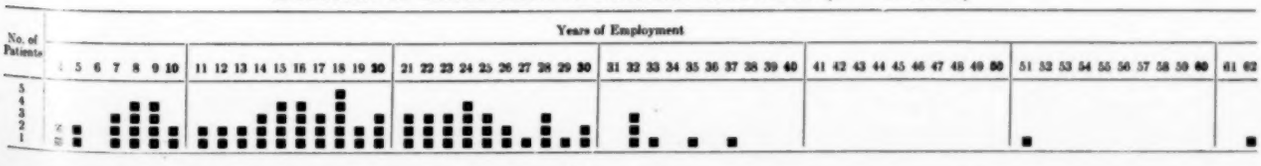


The physical findings were, in summary, as follows:

"Abdominal mass" (2)
Anemia (sec.) (2)
Anemia (sec.), hypertension
Arteriosclerosis (2)
Arteriosclerosis, emphysema, chr. myocarditis (?)
Arteriosclerosis, gastric resection for carcinoma
Cardio-vascular-renal disease (2)
Cataracts
Chronic myocarditis (3)
Chronic myocarditis, arteriosclerosis (2)
Chronic myocarditis, arteriosclerosis, anemia
Chronic myocarditis, arteriosclerosis, hypertension (3)
Chronic myocarditis, arteriosclerosis, pulmonary dis.
Chronic myocarditis, emphysema
Chronic myocarditis, malnutrition
Chronic myocarditis, chr. nephritis
Chronic myocarditis, obesity
Chronic nephritis, hypertension (2)
Gastric (undiagnosed)
Gastric ulcus
Gastric carcinoma
Hypertension (10)
Hypertension, angina (2)
Hypertension, aortitis
Hypertension, arteriosclerosis (2)
Hypertension, arteriosclerosis, chr. nephritis
Hypertension, arteriosclerosis, carcinoma of larynx
Hypertension, emphysema
Hypertensive heart disease (6)
Hyperthyroidism
Nephrolithiasis
Obesity
Obesity, hypertension
Obesity, hypertension, chr. nephritis (?)
Potential cardiac disease (2)
Pulmonary tuberculosis
Syphilis

TABLE V

DURATION OF EMPLOYMENT OF PATIENTS WHO DIED (4 — 62 Years)



Tongue resection for carcinoma
Underweight, herniae
Varicose veins
No diagnoses (14)

Comparison of these with the final diagnoses as obtained from death certificates showed that there were:

Thirty-eight who died from causes primarily related to the findings at the examinations.

Twenty-two whose deaths were due to more or less acute conditions, such as pneumonia, suicide, etc.

Seventeen who died from unrelated causes. The diagnoses in these may be considered as missed.

Three in whom the final diagnoses were unobtainable.

In all, then, of the "died" group, 17 final diagnoses were missed, or, at least, not described, in preceding examinations. These are shown comparatively in the following table:

MISSED DIAGNOSES

Examination Findings	Final Diagnosis
None	Chr. myocarditis, alcoholism
Cardiac enlargement, arrhythmia	Lung abscesses, chr. nephritis
None	Carcinoma (breast), metastases, terminal broncho-pneum.
Hypertension	Carcinoma (esophagus), myocard., nephritis
None	Carcinoma (gastric)
None	Carcinoma (colon), arterioscl., chr. myocarditis
None	Chr. myocarditis
Hypertension	Laryngo-pulmonary tuberculosis
Hypertension	Carcinoma (breast), post-oper.
Obesity	Carcinoma (breast), metastases
Potential cardiac, chr. ulcer.	Chr. cholecystitis (post-oper), lithiasis, broncho-pneum.
Anemia (sec.) hypertension, arterioscler.	Carcinoma (uterus)
Arteriosclerosis, chr. myocard., hypertension	Carcinoma (liver)
Arteriosclerosis, chr. myocard., anemia, cataracts.	Carcinoma (gastro-intestinal)
Malnutrition, myocarditis (?), chr. nephritis	Psychosis, diffuse toxic goitre
Anemia (sec.)	Arteriosclerosis, coronary thrombosis
Hypertension, aortitis, arterioscl.	Carcinoma (colon), intestinal obstruction.

Since the above cases furnish the basis for our conclusions brief summaries of the clinical course of most of them appear worth including:

E.A., 66 years old; automobile mechanic, employed 31 years. Gave a history of a prolonged rheumatic attack at the age of 15, confining him to bed for several months. On 12/20/29 a casual examination revealed enlargment of the heart and frequent extra-systoles. A periodic examination was done 2/18/30. Findings: irregular pupils; extensive pyorrhea; heart rate slightly irregular, fair sounds; left hydrocele; weight 166¼; B.P. 124/80, hgb. 75%; urinalysis, negative. He continued at work till 3/18/31 when he reported having had the "flu" during the holiday season, followed by a "gastric upset" and a cough ever since. Because of his physical and home conditions he was hospitalized. X-rays of the lungs showed a lobar pneumonia of the left upper lobe and bronchiectasis of the lower portion of the left upper. He ran a rapid downward course and died in acute uremia on 3/26/31. Autopsy showed multiple abscesses of lungs and chronic nephritis.

L.D., 52 years old; saleswoman, employed 10 years. Was examined on 4/12/35. Weight 143¼; B.P. 135/78, hgb. 84%; urinalysis, negative. No physical findings of note. A visit on 10/3/35 disclosed that while being examined by her doctor for a cold a breast tumor was detected and x-ray therapy had been commenced. A week later a radical mastectomy was done. Later symptoms developed due to compression of the nerves in the axilla. Patient died on 8/27/36. Final diagnosis: carcinoma of lungs following breast carcinoma, terminal bronchopneumonia.

D.M., 64 years old; picture-frame fitter, employed 21 years. Last periodic examination performed on 6/13/35, showed some arthritic changes and moderate hypertension. On 1/23/37 a note by the visiting nurse described much cough and weakness. His own doctor stated that the patient had pneumonia followed by a cardiac complication. Patient died 7/6/37. Final diagnosis: carcinoma of esophagus, chronic myocarditis and nephritis.

B.M., 70 years old; engineer, employed over 30 years, was last examined 12/12/30. Asymptomatic. Weight 137; B.P. 152/80; urine, negative. Slight visual and auditory impairment were the only noted findings. On 8/25/31 the visiting nurse's note reported inability to retain food. Later report of patient's death on 12/12/31. Final diagnosis: carcinoma of stomach, chronic myocarditis, senility.

A.S., 58 years old; carpet layer, employed 23 years. Was examined 5/22/30. Weight 135½; B.P. 148/90, hgb. 79%; urine, acid, S.O. 1.020 alb. 0, sugar 0, several hyaline casts, occasional granular one. In addition to the moderate hypertension noted there was some visual and aural impairment. Patient was allowed to continue, since these did not interfere with his duties. During an illness on 10/12/32 the nurse's note reported that, following an attack of grippe, patient developed cardiac decompensation. On 3/4/33 he was admitted to a hospital with severe abdominal pain, distention, and inability to void. Two days later a suspected diagnosis of carcinoma of the colon with metastases to the lungs (?) was made. The serology was found positive at the time and specific therapy was begun. The patient failed to respond and died on 4/6/33. Diagnosis: chronic myocarditis, arteriosclerosis, with carcinoma of the colon contributory.

W.J., 64 years old; clerk, employed 18 years. Was examined 4/9/32. There were no symptoms. Weight 152¼; B.P. 172/84, hgb. 80%; urine, negative. He continued at work. In response to a reported illness the nurse was informed of the diagnosis of pulmonary and laryngeal tuberculosis, made by the attending physician. He died at Loomis San., 3/27/35.

M.V., 55 years old; saleswoman, employed 13 years. Last periodic examination on 7/8/32. There was a history of incision of a perinephritic abscess in 1931 followed by a severe bronchitis. At the examination weight was 132½; B.P. 170/98, hgb. 85%; slight cardiac enlargement and moderate arthritic changes. Patient allowed to continue work. On 1/17/33 there were some suspicious findings and she was referred to a special clinic where the diagnosis of mammary

carcinoma was made. Two weeks later a radical operation was performed. Later developed a persistent cough and was admitted to another hospital. Pulmonary involvement. X-ray therapy later. Died on 9/16/33.

L.G., 51 years old; clerk, employed 10 years. Last examination on 7/2/30. Findings: weight 238½; B.P. 128/84, hgb. 70%; urinalysis, negative. No remarkable changes. On 3/16/33 was hospitalized for severe, persistent back pains. The suspicion was of carcinoma of the breast with metastases to the sacrum. Mastectomy done the following week. Later diagnosis of metastases to the left femur and spine; admission to a chronic hospital; radiation. Died on 3/9/34.

C.W., 55 years old; salesman, employed five years. Last examination 9/28/36. History of chronic duodenal ulcer which was quiescent at the time. Findings: weight 149¼; B.P. 138/78, hgb. 88%; urine, few pus cells. There were signs pointing to a potential cardiac condition. On 4/27/37 patient reported pain during the past week over the right scapular area. This promptly subsided on local therapy and he continued at work. On 9/20/37 the patient developed jaundice and was hospitalized. On 10/1 cholecystostomy and choledochostomy performed, stones removed. Despite transfusions and other measures patient continued to bleed from the wound. Later a retro-hepatic hematoma was removed.: The patient failed to respond and died 10/17/37. Diagnosis: chronic cholecystitis and lithiasis, obstructive jaundice, bronchopneumonia.

M.H., 68 years old; stock clerk, employed 26 years. Marked secondary anemia was noted four years previously. At the examination of 9/22/34 the hgb. was 45%; weight 104¾; B.P. 160/80; urine, acid, alb. 2 plus, sugar 0, abundant R.B.C., pus cells, and a few hyaline casts. She complained of weakness and urinary symptoms including hematuria. A diagnosis of secondary anemia, arteriosclerosis, and hypertension was made and the patient was advised hospitalization. There operation for the uterine carcinoma, which was found, appeared contra-indicated. X-ray therapy later at another hospital. Patient rapidly declined and died 2/2/35.

C.K., 87 years old; retired salesman, employed 31 years. No history of preceding illness. On 2/3/31 findings were: weight 147¾; B.P. 168/82, hgb. 78%; urine, negative. Diagnosis: arteriosclerosis, chronic myocarditis, hypertension. Retirement was recommended chiefly because of the age, and this was accomplished two months later. He visited the clinic on 6/20/34 when surgery for an epithelioma on the upper lip was recommended and refused. No data were obtainable of the last illness. Report of patient's death on 3/31/35. Diagnosis: carcinoma of the liver.

J.S., 82 years old; cabinet-maker, employed 24 years, never seriously ill. At the examination of 1/20/31 cardiac enlargement, impaired heart sounds, arteriosclerosis, and cataracts were found. B.P. 150/80, hgb. 63%; urine showed a few hyaline casts. Retirement was recommended and occurred six months later. No data regarding the patient's subsequent illness was obtainable beyond the final diagnosis of carcinoma of the stomach and intestines. Died 10/26/31.

F.W., 58 years old; elevator starter, colored, employed 30 years. Examination done 3/24/36. Complaints of weakness and recent loss of 30 lbs. Findings: heart sounds of poor quality, arteries sclerotic. Weight 159; B.P. 140/65, hgb. 11.3 gms urine, acid, S.G. 1.016, alb. faint trace, sugar 0, hyaline and finely granular casts numerous. Wassermann negative. Gastro-intestinal study was negative. The gall-bladder was suspicious. N.P.N. 37 mgm. per 100 cc. The patient was hospitalized 4/17/36. Basal metabolic rates of plus 35.5 and 31.3 led to recommendation of surgical intervention. While waiting in preparation for this the patient's mental condition became poor and he had to be transferred to a city hospital. There he became confused, restless, and rapidly declined. He died 5/24/36. Diagnosis: psychosis, diffuse toxic goitre, general arteriosclerosis.

J.J., 71 years old; receiving clerk, employed 35 years. In 1928 the patient complained intermittently of substernal pain for about a year. At that time the opinion was that he should be retired. However, the condition improved and he continued at work. At his last examination on 6/17/30 a moderate anemia (52%) was noted. B.P. 120/70; urine, negative. There were no other outstanding findings. However, it was questioned whether he should continue at work longer. On 2/10/32 the nurse's note at the visit reported "cough and weakness." He died 3/7/32 of a coronary thrombosis and general arteriosclerosis.

S.N., 64 years old; woman, order clerk, employed for 17 years. Was last examined 11/6/30. Findings: aortitis, arteriosclerosis, hypertension (220/116); weight 172; hgb. 74%; urine, negative. Advisability of further activity was questioned. She was later admitted to Bellevue Hospital with a suspicion of gall-bladder disease. She died 2/11/31 of acute intestinal obstruction from carcinoma of the transverse colon.

It is notable that 10 of these were malignancies, three being in the breast, the rest in inaccessible organs. Excluding the deaths due to acute states (22) and the three unreported cases, 38 of the total, or almost 70%, were correctly diagnosed. Since the time interval is a factor it is interesting to note the period elapsing between the last examination and the date of death:

Less than a year (2, 3, 6, and 9 months)	4 cases
1 year	5 cases
2 years	2 cases
3 years	4 cases
4 years	2 cases

Discussion

A REVIEW of the medical histories of 500 employees of a department store, who were past the age of 50, was undertaken with a view toward the evaluation of the accuracy of the general diagnosis on the part of a small group of physicians, devoting part of their time to the clinic. As products of the more recent tendency in medical education, emphasizing, among other things, the preventive aspect, they may be considered as fairly representative of the general medical population or of the accredited type of industrial clinic staff, performing the recognized periodic physical examination. The data considered here are based on 1493 such examinations, each employee having had at least one. There was no selection of the material beyond the inclusion in this number of the 80 employees who died since the institution of that type of examination in 1930, thus permitting a comparison of the final diagnosis, as obtained from death certificates, with previous findings in the records. Although data from such certificates may not always be above question it was felt that, under the circumstances, its use was within accepted limits of error.

The minimum age of 50 was set because it offered obviously a longer employment span and with it the expectancy of physical changes for the deduction of any conclusions in such a review. Because the health aspect of this age level, from the standpoint of employability, is such a prominent question in industry today, this was a point of added interest. As for the examination itself, while not to be compared with that of specialized diagnostic units, it was undoubtedly superior to that of the common, busy dispensary.

The group consisted of 344 men and 156 women, ranging from 50 to 87 years in age and with terms of employment from four to 62 years. One hundred and nine were engaged in selling, while the remaining 391 included all non-selling occupations, from locker attendants to loaders of heavy stock. The most frequent of the diagnoses made was of vascular hypertension—almost 30% of the total—the standard set being a systolic pressure of 150 mm. or more. Next in order of frequency were chronic myocarditis, arteriosclerosis, hernia, obesity, arthritis, varicose veins (including ulcer), defective hearing, defective vision, and chronic nephritis. There were 134 records without any findings of note. A measure of the accuracy of the diagnoses, as previously stated, was seen in the data of those who died. Of the total of 80 of these, three final diagnoses were unobtainable, while 22 died of acute or sudden causes, there being no statement of other basic pathology for comparison. Diagnoses which were related to the latter causes of death were made in 38 of the remaining 55 patients. The diagnoses in 17, then, were incorrect. In the group as a whole there was accordingly a diagnostic accuracy of about 70%, which is an acceptable average. It is significant that 10 of the errors were in cases of malignancy, chiefly in inaccessible organs. Stress should be laid on the adequate examination of the female breast and on the gastro-intestinal tract which presents a prolonged symptomatology. While the number of cases may be considered too small for any deductions the paucity of similar analyses for comparison makes such a review desirable, if only for the purpose of stimulating such studies elsewhere.

The conclusion would seem justified that the regular physician, acquainted to some extent with the demands of the work of the individual employee, is capable of performing a physical examination which, combined with the simpler laboratory aids, offers a reliable basis for diagnosis in approximately 70% of the cases.

New Books

Review by

FREDERICK W. SLOBE, M.D., F.A.C.S.

MODERN SURGICAL TECHNIC, by MAX THOREK, M.D. Published by J. B. Lippincott, Philadelphia. Three volumes; 2,045 pages; 2,174 illustrations.

THIS is a three-volume treatise on surgical technic totaling 2,045 pages with 2,174 illustrations, the originals being chiefly by W. C. Shepard. The first volume deals with general operative considerations, surgery of the head and neck, and plastic surgery. The second volume covers the nerves, vessels, bones, breast, and chest. The third volume includes abdominal surgery, gynecologic operations, and genito-urinary surgery.

The work is a monograph and, as such, there is a striking uniformity in the style, clarity of description, and method of handling each chapter. A typical example of the manner in which a subject is treated includes anatomic considerations, reference to both domestic and foreign operative procedures, followed by a description of the one or several operations preferred by the author.

It is interesting to compare these three volumes with certain systems on surgery some of which occupy seven to 10 volumes, others being condensed in one, as regards the descriptive matter on operative technic. It is obvious that the one-volume work must be too condensed and sketchy to yield a comprehensive description of the vast field of surgical technic. The larger works, on the other hand, are usually a compilation of many chapters written by as many different surgeons. These various chapters differ, very often, just as markedly in their quality and arrangement as there are variations in the individualities of the various authors. As a result some of the chapters have profuse and excellent descriptions of operative technic and others have almost no technical description, depending upon the opinion of the writer as to the importance of technical considerations in presenting the subject. At the same time it is true, of course, that there are authorities in certain special fields who are capable of presenting a single subject better than any one man who endeavors to cover the whole subject.

On the basis of this comparison the author seems to have eliminated most of the disadvantages and retained most of the advantages. The descriptions are very definitely practical; the arrangement is very orderly and clear, and the author has combed the world for his selection of operative procedures. A comprehensive index allows one to find the subject in which he is interested with facility.

The illustrations constitute an outstanding feature of this work, as is so essential in any operative treatise. Many of them are original drawings by Shepard; others are photographs; and still others diagrams. Together they give the reader an excellent graphic demonstration of the procedure he wishes to follow. Perhaps the fact that the author has international renown in the field of amateur photography has significance in the quality, quantity, and choice of these most valuable iliustrations.

Dr. Thorek's work ranks as one of the finest of its kind. It should remain as a lasting monument to him, and should be of tremendous aid to the surgeon who wishes both to review and improve his knowledge of operative technic.

Review by

WM. D. MCNALLY, M.D.,

MEDICAL VOCABULARY AND PHRASES. By JOSEPH S. F. MARIE. Published by P. Blakiston's Son and Company, Inc., Philadelphia.

THIS is a book of 358 pages, giving a selection of medical words with their translation from English, German, French, Italian and Spanish. It includes the names of many articles in common use in the hospital and general practice. Also a collection of phrases that would be of value in clinics where a physician, when an emergency arises, could make use of this book to supply his vocabularly with words to aid in diagnosis until someone can be contacted who is more conversant with the language of the patient.

This Vocabulary supplies a long-needed book for the research worker in his library, postgraduate and foreign clinics work; and at his attendance of the International Medical Congresses, this book could be used as a handy reference to a medical knowledge in five languages.

An appendix is included which gives the pronunciation of vowels and consonants in the various languages.

Industrial Medicine

Reg. U. S. Pat. Off.

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Examination Program

WISCONSIN'S new Physical Examination Program, as embraced in a declaration of principles, and the report of a joint advisory committee, assisted by a medical subcommittee — all included in a bulletin recently gotten out, with permission, by Employers Mutuals, of Wausau — is carefully reviewed by DR. HAYHURST, on pages 392-395. The Program is "designed to aid in the control and prevention of occupational diseases and accidents and to promote industrial health." It is the first venture of this nature presented by a public agency—timely, in that, while "it has long been recognized that physical examinations play a part which is second only to engineering control," the recognition is now rapidly becoming general in all quarters.

In comment, such a program has practically the full force of compulsory legislation because formulated by spokesmen of the different interests concerned, and will undoubtedly have overwhelming approval. Thus, the occasional recalcitrant or neglectful personal groups may be expected to have the weight of public opinion against them—law or no law—and, after all, this is largely the force which "keeps the wheels going round."

Compulsory physical examinations have long been advocated by industrial hygienists as a logical procedure to fit the worker to the job and maintain general economic efficiency. Three objections have stayed the day — the expense, the possible misuse of such examinations for getting rid of certain employees, and the question of what shall become of those "cast upon the scrap heap."

As far back as 1924, DR. H. S. DIEHL, in charge of the Student Health Service at the University of Minnseota, pointed out that 95% of the 26,960 voluntary calls at the student dispensary in the preceding school year were such as would never have sought medical aid of any kind except for the presence of such an opportunity.

As a general rule, employers and official bureaus have long accepted the idea, but organized labor, principally for the reasons cited, has been very slow in responding, no doubt feeling that expediency surmounted the economies of the situation. However, again as far back as 1912, the International Ladies Garment Workers Union set up its own health center in New York City which has been constantly under the general supervision of DR. GEORGE M. PRICE, formerly with the New York State Department of Labor. A similar movement was fostered, principally by the painters' unions of New York City, which established its own center for physical examinations in 1924, but this survived only a year or two.

NOW we read that the United Automobile Workers, affiliated with the Congress of Industrial Organizations, adopted in July this year a "Model Health Clause" for union contracts which provides, among other features, that all new workers hired by a company shall have a complete physical and laboratory examination—including lung x-ray, standard luetic tests, and urinalysis, and that no worker shall be denied employment for non-contagious venereal disease or arrested tuberculosis.

The contracting company is to agree to furnish licensed physicians for an adequate diagnosis of cases and to give and supervise medical and surgical aid to workers, the injured or diseased worker to have free choice of physician and to receive reports of examinations and laboratory tests made by the company physician or insurance-carrier physician. No employee is to be denied the right to his job if his family physician says he is able to work. In case of dispute between the company physician and the employee's physician, the case is to be decided by a neutral physician agreeable to both parties. Provision is also made for workers to return to the same seniority rating for a period of not less than 60 days following a compensable disability.

We learn also that the American Federation of Labor adopted a resolution at its Houston Convention in October, 1938, demanding that boards of education require physical examinations of students of trade and vocational schools. We understand the Federation has long endorsed voluntary periodic health examinations of workers.

Hats off to Wisconsin which has started the ball rolling in a state-wide manner. We have every reason to believe that the stopping of another great waste in industrial procedure is on the way out.

INDUSTRIAL HEALTH AND DISEASE

Dermatitis and Other Industrial Hazards
A Summary of Causes and Prevention

HOWARD E. COLLIER, M.D.

THE word "Dermatitis," like "influenza, rheumatism," and many other medical terms, does not possess a definite meaning either in medicine, in science, or in practical life.*

For the purpose of this paper, "Industrial Dermatitis" may be taken to mean "an affection of the skin *predominantly* due to occupation," thus "dermatitis" is distinguished from the "eczemas" and the other non-industrial skin diseases. This definition includes skin lesions and diseases other than "dermatitis produced by dust or liquids" (which is the medico-legal definition of "dermatitis"): such as "trade ulcers" and industrial skin cancers.

Our purpose is to suggest a method —to outline a scheme—by which the industrial manager can investigate an "outbreak" of industrial dermatitis in any factory under his management, with a view to the prevention of more cases.

Industrial dermatitis is seldom if ever due to a single cause. The idea that for every illness a solitary cause can be found is one of the commonest mistakes made during the practice of industrial hygiene and medicine. Managers and engineers trained in scientific methods do not always realize that illness is the final outcome of the action of a considerable number of delicately balanced and related causes. If an ordinary person were asked to name "the cause" of pneumonia, he would probably reply that the cause of pneumonia was the *pneumococcus*. In actual fact, this is far from being the whole truth since the occurrence of a case of pneumonia may be due as much to personal strain, to anxiety, or perhaps to exposure to an industrial dust as it is to the germ itself.

In almost every illness three major groups of factors or "causes" can be discovered and should be sought for. These three groups in the case of pneumonia are: (1) The "particular factor," *e.g.* the pneumococcus; (2) the occupational factor: dust, chill or exposure and (3) the personal factor: overstrain, malnourishment, etc. When we come to apply this conception of the causes of disease to the problem of dermatitis, we find that both the particular and the occupational causes operate within industry itself. The "particular cause" of dermatitis is usually some specific, well-recognized substance such as turpentine, alkali or oil. The other occupational factors are often overlooked.

It should be obvious, therefore, that a wide approach both to the "diagnosis of the causes" of dermatitis and still more to the prevention of industrial dermatitis in a factory, must always be made. To the industrial manager "dermatitis" will probably remain a mystery until he is prepared to recognize the disease for what it is, namely—the reaction of a particular *individual's* skin to a more or less complex group of *industrial factors*.

In the majority of instances, industrial dermatitis is emphatically a "preventable disease," but it will never be prevented by a narrow-minded concentration upon a single particular or specific "dermatitis-risk."

Let us suppose then, either that a single case of industrial dermatitis or a series of such cases has occurred in a particular factory: what steps can management take to track down the causes out of which that case has arisen, and what steps can management take to prevent the occurrence of further cases?

IT IS a truism to say that an accurate knowledge of "possible causes" is the first step in prevention. We have seen that the causes of industrial dermatitis may be classified under three categories, two of which are "industrial" and the third "personal."

Personal Factors:

1. The fact that a case of skin disease has occurred *in industry* is of itself no proof that it has been produced *by occupation*. It is known that some types of individuals are peculiarly prone to skin disease. One authority has said that one person in every 500 will contract dermatitis, no matter what occupation he follows. It is most important that managers should realize that these are persons who possess hyper-sensitive skins, and that to some extent, these persons can be recognized. By a careful selection of workers for an occupation in which there is a dermatitis risk, a substantial proportion of cases of dermatitis could be avoided. To this point we shall return later. Meanwhile, it is clear that *constitution* is one of the most important personal factors in the production of dermatitis. Next among the personal factors should be placed *personal and social habits*, that is to say, personal cleanliness, diet and conditions of living. So far as the manager is concerned, he may have little direct control over these factors, nevertheless it is well to remember that "a dirty man makes a dirty worker" and a dirty worker is always liable to develop skin disease upon the slightest provocation. Finally, under the personal category comes "personal health." The skin is one of the organs of the body, and as such, reacts favourably or unfavourably to all conditions of health and disease. The skin of a sick man may break down before conditions that would not affect him when he is well. But of all illnesses, those that are most liable to determine the onset of dermatitis are septic conditions of the face, hands, scalp, nose, throat, teeth and ears. Gastric disorders may be important, also *e.g.* chronic appendicitis. During the selection of workers for an occupation in which there is a "dermatitis risk" these facts should not be overlooked. Perhaps only a doctor is really able to estimate the "personal factors" in the causation of dermatitis. (Important psychological factors also affect personal liability to dermatitis, but of these there is no space to write here).

We turn therefore to the *industrial factors*, which may be either specific or general.

(*a*) *The specific industrial factors* are usually well known in each particular industry for example, sugar is the specific factor in the confectionery trade, chrome or alkali or nickel in the plating industry, tar in the gas works, and so on. Nevertheless, the specific hazards are by no means always recognized. The material or methods of manufacture may be altered, or new substances may be introduced. It is essential, therefore, that whenever a case of dermatitis occurs, a careful and exact enquiry should be made with a view to finding out what kinds of materials actually are being used, how they are being used, and by whom they are being handled. "Vague ideas," "approximate compositions," and "what the supplier says" — these are red herrings dragged across the trail of the manager who is trying to solve the problems of dermatitis.

To present a complete list of the "specific hazards" encountered in modern industry would carry us too far afield. It is proposed, therefore, to give a brief list of the important "specific and secondary" hazards. This list and the figures in it are taken from a study of almost 2,000 consecutive cases reported to the Home Office during the year 1937:

GROUP I. THE INDUSTRIAL SOLVENTS

	Cases
Degreasing Agents	155
Paraffin	69
Turpentine and Substitutes	98
French Polishers	29
Carbon-Bi-Sulphide	1
Total	352

* In *Labour Management*, London, July, 1939.

GROUP II. THE ALKALIS	
Alkaline Fluids	317
GROUP III. VARIOUS CHEMICALS	
Unclassified Chemicals	170
Chrome	63
Nickel	14
Acids	53
Arsenic	9
Iodine	4
Calcium Carbide	1
Total	314
GROUP IV. PHYSICAL AGENTS (Secondary or Non-specific Industrial Factors)	
Heat and Friction	221
Secondary to Injury	32
Water	9
Clay	1
Total	253
GROUP V. OIL	254
GROUP VI. BIOLOGICAL AGENTS (Not Infectious)	
Sugar	106
Flour	15
Dough	23
Grain	2
Wood	1
Celery, Carrots, Oranges	23
Tobacco	19
Total	1
GROUP IV. COAL-TAR AND ITS DERIVATIVES	
Dyes	11
Coal-Tar and Derivatives	20
Total	135
GROUP VIII. SYNTHETIC RESINS AND RUBBER	
Formaldehyde	14
Synthetic Resins	12
Accelerators	9
Total	35
Recurrent Cases (after change of occupation)	47
Uncertain	69
	19

These figures do not present an accurate picture of the *incidence* of cases of dermatitis in the country as a whole, since it is not known, for example, whether the 98 cases of turpentine dermatitis occurred amongst 10,000 or 100,000 workers with turpentine; that is to say, the *"population at risk"* is not known: nevertheless, certain important practical points stand out quite clearly.

(1) First of all the practical importance of the *alkalis, solvents* and *oils* as the primary cause of many cases of dermatitis should be noted. This is particularly the case whenever an exposure to some well-recognized skin hazard such as chrome, arsenic, sugar or formaldehyde is not present in the occupation. If dermatitis appears in an occupation in which its occurrence is not usually expected, the industrial manager should make quite sure that an unrecognized exposure to *alkaline fluids or to solvents does not exist.*

Alkalis

In our experience the alkalis deserve particular attention. The commonest industrial materials containing alkalis are:

(*a*) Alakline baths, washes and solutions (soda, potash and ammonia).

(*b*) "Hard waters."

(c) Soap, soap solutions, cleaning materials and washes, scourers, suds and furniture polish.

(*d*) Certain cutting oils and cutting compounds.

Solvents

(2) So far as the "solvents" are concerned, it may be said *that prolonged or excessive exposure of the skin to any solvent will cause skin trouble,* but benzol (and of course turpentine and its substitutes) and kerosene or paraffin are the most important in this connection. It is worth remarking also that the paraffins and petrols cause a "solvent" dermatitis, rather than a "mineral oil" dermatitis, and that the clinical differences between these two types of dermatitis can usually be recognized by a medical man.

(3) *The mineral oils* usually cause what is called an "oil acne" or blackhead. This condition is due to the blocking of the sweat pores and the hair-pores of the skin, complicated by septic-infection. Oil acne occurs especially on the forehead and face and upon any part of the body that is exposed to continued friction by oil-soaked clothing. It occurs, therefore, on the thighs and forearms. This condition is liable to be complicated by septic infection. Indeed all workers with oils, and especially animal and mineral oils, are liable to septic trouble unless proper precautions are taken.

It may be added also that certain of the mineral oils belonging to the "spindle-oil" class possess definite cancer-producing properties. These oils are not extensively used outside the textile industries.

(4) Attention should be drawn also to the *tar and coal-tar derivatives* as a possible specific cause of dermatitis, and also the group classified as "various chemicals." Among the "tar" group creosote, cresol, phenols, lysols, etc., and some of the aniline derivatives, *e.g.* "ursol" or paraphenylenediamine and hydroquinone, are important.

By one means or another, therefore, the industrial manager should discover whether any specific irritant is present in the occupation, and if so, what it is. If, however, the enquiry ceases at this point, it may fail to achieve its purpose and will get no further than enabling the manager to say "the cause *might be* so-and-so." Therefore, the study of the secondary or general industrial causes must next be undertaken.

For the present purpose it is enough to say that the important secondary causes are: 1. *Sepsis,* 2. *Heat,* 3. *Moisture,* and 4. *Friction and Injury.* It may happen that work has proceeded for months without incident, in a shop in which a slight "dermatitis-hazard" is known to exist; suddenly without warning a series of cases occur. In the majority of instances the real explanation is that some change has occurred in the "general conditions" in that shop. This change may be the occurrence of sepsis or it may be an alteration in the temperature or moisture of the shop.

Outbreaks of dermatitis are well known to occur in summer, particularly in muggy, hot weather. Isolated cases of dermatitis may occur in close proximity to ovens, stoves and boilers, although the rest of the workers in the shop are unaffected. These are facts that should be realized by every industrial manager. Again, suppose that a group of workers are engaged in such a process as dipping metal parts into a vat of paraffin; if one of these workers is suffering from a septic condition of his ears, nose or skin, he may infect the oil with virulent septic germs. If any other worker injures his skin at work, that injury may become infected with germs, and he in his turn may infect the vat and the other workers from his own septic sore. It is not to be wondered that disease spreads.

In considering the "secondary industrial source" of dermatitis, therefore, particular attention should be paid to temperature and moisture and to sepsis and injury.

Finally the effect of overtime, in increasing the length of exposure of the workers' skin both to the primary and the secondary causes, should be remembered.

Such in general terms is the diagnostic scheme suggested for the use of the industrial manager. We shall not be misunderstood if we say that we consider that the manager may feel a need for medical help in all but the most straightforward cases. Medical men who have made a special study of these problems can be found.

Having reached a diagnosis, the next question that demands an answer is whether the case under consideration is an isolated case and is due to "temporary or accidental circumstances" or to strictly personal causes, or whether this case is evidence that the skins of a considerable number of workers are just on the point of breaking down?

The fact that only *one* case is disabled by skin disease is *not* proof that only one person has been affected. Therefore, whenever one case of skin trouble occurs, the skins of *all the workers engaged in similar work* ought to be examined at once. Otherwise a series of similar cases may occur during the next few weeks. We have seen that the sensitivity of the skin of different workers varies considerably: the weakest first "goes to the wall," and whilst only one case may be reported, the hands of other workers may show cracks, fissures, broken and damaged nails, rashes and roughened areas which may be the precursors of further serious trouble.

Let us suppose then that the industrial manager has come to the conclusion that in a particular shop a certain group of workers is exposed to a definite dermatitis-risk, that he is satisfied in his own mind what are the "primary and secondary factors," what steps can and ought he to take to minimize the risks?

[NOTE: The second portion of this study by DR. COLLIER, "Principles of Prevention," will appear in the October issue of INDUSTRIAL MEDICINE.]

Food in Industry

BUSINESS and industries in increasing numbers are establishing nursing departments and food departments for the benefit of their employees.* These services are offered to employees in banks, department stores, factories, manufacturing concerns, steel mills, and other industries, large and small. More and more the nursing and food departments are joining hands. And today many nurses in industry actively supervise the food departments to some degree — both those serving full meals and those which serve merely light, supplementary foods.

Industrial nursing has two main objectives, emergency treatment and preventive work. Preventive work means keeping employees well and on the job. Here food plays an important part. Employees must have proper food in correct amounts, substantial, well balanced, and at low cost. The nurse is not responsible for preparing either regular food or special diets, but she sees to it that the right kind of food is provided and that it is properly prepared and tastily served so that the employee is kept in condition to perform his particular task to the best of his ability.

The number of industrial nurses assuming active supervision of the food service in industries is increasing. Of course, each industry's food requirements depend on the type of work in that industry. We are inclined to think that manual workers require heavier foods and larger quantities of food, and that office workers need only the lighter foods. But it may be surprising to learn office workers or "brain workers" require good, substantial foods, though in lesser portions. It is the overloaded stomach that results in sluggishness and sleepiness, whether the employee is engaged in manual or mental work. Well cooked food that looks and smells appetizing keeps a well stomach well and often makes a healthy stomach out of an ailing one. In industry we are dealing primarily with well people and we want to keep them that way.

It is quite as essential for an industrial nurse to know what food the workers eat as it is to know that hazards are removed, machinery properly guarded, and sanitary working conditions provided. Days lost because of illness or hours lost because of indisposition result in lost time. Decreased efficiency in workers cannot even be computed. The nurse should know the food requirements for workers in her industry, and cooperation, at least, between the nursing and the food departments is important. In many industries the dining department is managed by persons who do not have special training—and often not any training or knowledge—in regard to food and nutrition, and who make no study of the food requirements of employees. The noon meal is the main meal of the day for many workers; therefore, it should be planned to furnish the largest amount of nutrition possible.

The supervision of food in industry will extend the boundaries of industrial nursing, opening up a broader and more interesting field, and will make the industrial nurse of greater value to her employer, to her employees, and to her self.

* MABEL C. BEELER, R.N., Director, Medical and Welfare Department, Federal Reserve Bank, Kansas City, Missouri; presented before the Industrial Nursing Section Round Table, Biennial Convention, Kansas City, Missouri, April 27, 1938; published in *Public Health Nursing*, July, 1939.

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